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Railway Age

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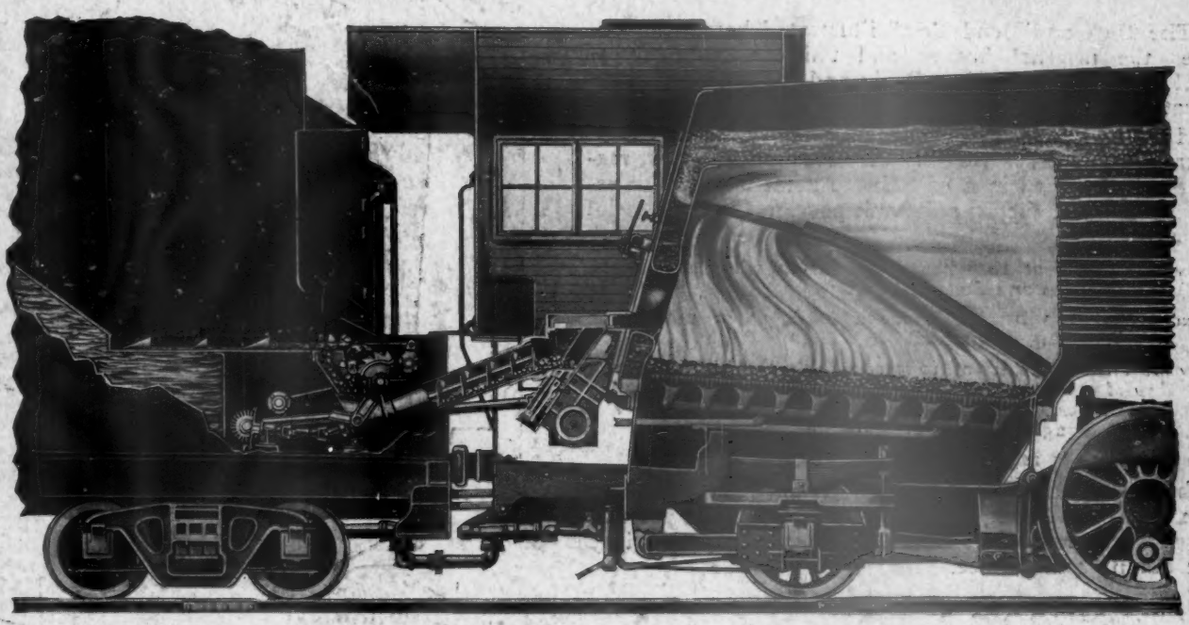

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Satisfy yourself that these results are being secured by investigating on roads where Elvin Stokers are in use.

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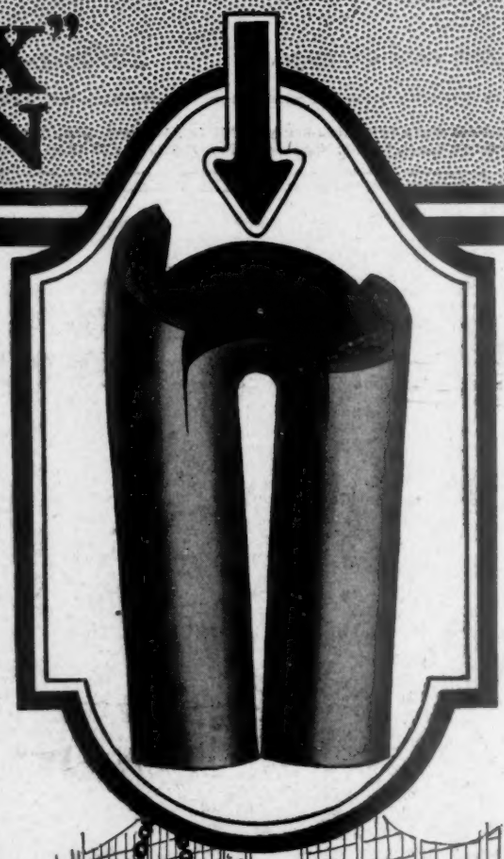
The Nick and Bend Test
applied to "H.B." and "AJAX" IRON CHAIN



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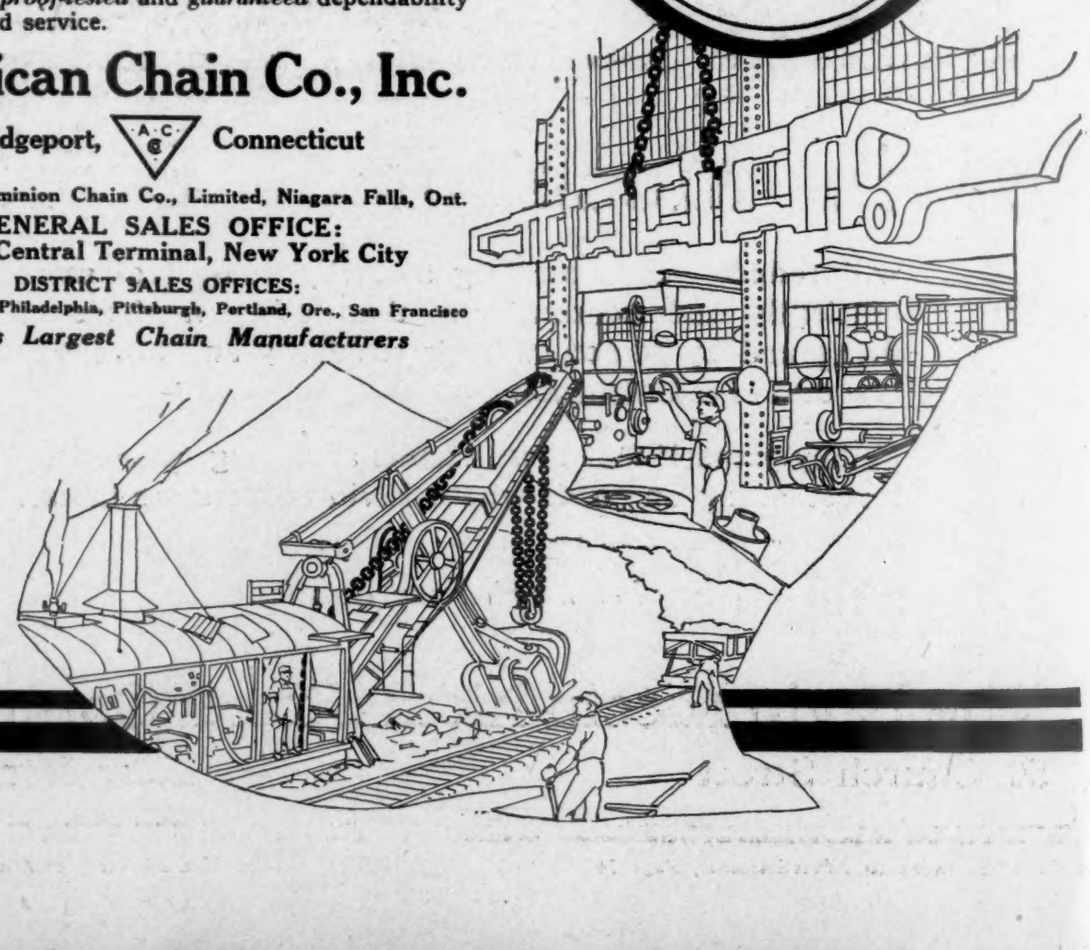

EDITORIAL

Railway Age

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Interesting Statistical Material

The two articles entitled respectively, "Expenditures of the Railways for Labor and Material" and "Operating Revenue and How It Was Expended," which appear in this issue will be read with more than ordinary interest. To be sure, they point out facts and results which are already known, but it is to be doubted if the available data as to the developments in recent years in railway earnings, expenses and net have ever been put together in a more striking and useful manner than is done in these two articles. As pointed out in the second article in question, the difficulty in analyzing the figures relating to railway operation is that of visualization. The data which are presented and the manner in which the colored charts in particular are gotten together will permit the visualization in a way that will not be readily forgotten. The Bureau of Railway Economics, to which the *Railway Age* is indebted for the data which are used and for the colored charts which are reproduced, has, in working up this material, performed a service for which it is indeed entitled to congratulation.

The Chilean Electrification

Unconfirmed press reports from Chile indicate that a large American electrical concern has been awarded the contract for the electrification of the State Railway's main line from Valparaiso to Santiago, a distance of 125 miles. The press reports state further that the contract has been awarded with some stipulations which have not as yet been accepted by the American concern in question. The cost of the installation is said to be in the neighborhood of $10,000,000. Obviously this is a contract of no small importance and is one which those interested in our foreign trade will be glad to see come to one of our own concerns, but the monetary consideration involved gives no adequate measure of the real importance of the work. Chile is a mountainous country and the consequent heavy grades naturally suggest the advisability of electrification. An installation like this will undoubtedly, if satisfactory, result in more and more electrification. In such a case the natural tendency would be, matters of price and finance being equal, to turn to the country which makes the first installation. The situation is one of vast opportunities and the confirmation of these press reports will be awaited with considerable interest.

When Do Railways Get Their Profits?

When profits in manufactures, agriculture and other lines of business were large before the war, and railway traffic would easily have borne higher rates, the railways were not allowed to advance the rates. They were told by regulating bodies that the railways had no moral or legal right to advance the rates being paid by a particular class of industry because that industry was prosperous and easily could afford to pay higher rates. Consequently, railway rates constantly declined in proportion to the prices of the commodities on which they were applied, and railway profits stood still or declined, while profits in other lines of business increased. Under government control when other industries were making enormous profits, the railways were rigorously restricted to the same return they had made in the three years before the war. At present neither the railway nor any other important branch of industry is prospering. Prices recently have declined until the freight rates charged for transporting many commodities are much higher in proportion to their prices than before the war. And now the railways are told by numerous persons and publications that they should reduce their rates to enable certain kinds of business to be done at a profit, even though the operating costs of the railways themselves are so high that reductions of rates would make it impossible for an indefinite time for the railways to earn a reasonable return. In other words, the railways were not allowed to advance their rates in order to share in the profits of industry when large profits were being made, and now it is demanded that they shall reduce their rates so that they will share to a disproportionate degree in the losses of industry when the losses of industry are large. Could any surer way to ruin an industry be conceived than to deny it opportunity to share in the increased profits of business when profits are increasing and compel it to participate fully in the losses of business when losses are being taken? When railways are regulated with business sense—if they ever are—they will be allowed to make large profits when large profits are the rule, and thereby be enabled to take losses when losses are the rule. Unless they get their share of the profits, with what are they to pay their share of the losses?

Knowing What It Costs

If the railways may be justly criticized for one thing more than another, it is for their lack of knowledge of many of their operating costs. Their activities are so complex and are performed under such a variety of conditions that the collection of this information is difficult. At the same time, these very conditions make information of this character all the more valuable. No manufacturer can succeed today without a knowledge of the cost of production of each of his products, for it is only with data of this character that he can determine which of his several products to push. Likewise, while the railways must handle all of the business offered to them, they can still select that for which they shall compete most actively and that road prospers most which exercises the best judgment in the selection of the traffic it goes after. It is equally true that the success attending any plan for conducting railway operations must be measured by its effect upon the net revenues, as was pointed out by J. E. Hutchison, general manager of the St. Louis-San Francisco, in his article describing the development of unit cost data on the operation of freight trains in the *Railway Age* of July 23, page 161. The system which has been devised on the Frisco enables each operating officer to know at the beginning of each day the cost of operating the freight trains on the road for the day before. He is thus enabled to detect any unfavorable influences affecting operating costs adversely and to adopt such measures as may be necessary to correct them.

What has been done with reference to these items can be done elsewhere in railway service. When such data are available and only then will railway officers be able to reduce their operating costs to the lowest limit for so long as they are in the dark as to the nature of any of these costs they are unable to know where to look for opportunities to make further reductions.

A Contrast in Practices

A British contemporary recently reviewed English practice in the use of concrete by the railroads, pointing out that whereas this material is applied extensively for overhead bridges, posts, poles, etc., only limited use is being made of it for bridges carrying railway trains. Reluctance to apply this material to railway structures is ascribed primarily to a doubt in the minds of English railway engineers concerning the ability of concrete to resist the vibration set up by the rapidly moving loads. A question is also raised as to the permanence of the bond between concrete and steel under these conditions. A discussion in another issue of the same journal with respect to the relative merits of concrete and stone arches which clearly favors the latter places further emphasis on this seeming lack of confidence in the use of the newer construction material. This attitude of the English engineers is in sharp contrast to that of the officers in charge of structures on American roads where stone is now used for bridges only in cases of special architectural treatment, for salt water construction or bridges of unusual magnitude. Reinforced concrete has been used for so many years in railway bridges in this country that it has come to be accepted almost universally as a standard material of construction. Such instances of failure or unsatisfactory service life as have been brought to light are ascribed in most cases to the use of improper materials or poor workmanship. Consequently, scientific investigation in this country with respect to concrete is directed almost entirely to the elimination of these causes of failure and a higher degree of refinement in workmanship.

Make Use of What Others Have Done

Under the circumstances prevailing during the last year or so it has been necessary for railway officers to deviate at times from their customary methods. Further than that there has been a tendency toward the speedier adoption of the newer methods as already tried out successfully by other roads. Even with more normal conditions and more nearly normal traffic, the railways will find themselves working under circumstances that will often call for the use of what would have been unorthodox methods a few years ago. This condition may be hastened and thus the roads benefited sooner by the realization of railway officers in general that they can no longer work entirely by rule and that in the future they must be even more broadminded than they are today. An instance indicative of this realization was shown recently by an advertisement in a metropolitan paper in which a large industrial firm stated frankly that while it wanted a high calibre man already holding an important position, it did not want a man who worked by rule but rather one who was open minded enough to do the unconventional. The railroads have many men of this calibre but too often their hands are tied. A condition which should not exist is well illustrated by the remarks of an engineer maintenance of way who said in effect that it often took him months and even years to secure a small authorization for something new to his superior officers, even though it was of proved resultant economy on other roads and readily adaptable to his. On the other hand and at the same time he could easily secure an authorization for from two to five times the amount in money for something well known to his officers but not particularly needed.

The Equivalent of Rate Reduction

An important characteristic of railroad transportation in recent months which those who are clamoring for reductions in freight rates have apparently ignored is the greatly improved service which many of the roads are offering. An example of what is being done in this direction is the speeding up of the fast freight schedules. Commodities moving in refrigerator cars and other perishable goods are now being delivered in New York on the fourth day after leaving Kansas City, the third day after leaving Chicago and St. Louis and the second after leaving Toledo or Detroit. Similar improved schedules are in effect between other cities. In other words, while the charge to the shipper is the same, the service rendered him is much greater and consequently what is, in effect, a reduction in charges has been brought about. And in addition, with these improved services shippers can now in many cases avail themselves of freight transportation instead of the more costly express service. Where this is possible the actual cost to the shipper has, of course, been reduced. In any event the shipper of these commodities is getting more for his money than he formerly did and this fact should be given the consideration it merits by those who are attacking the prevailing scales of rates.

An Age of Specialization

Few persons realize the extent to which specialization is necessary in the efficient operation of a large railroad. Not only is the organization divided into a number of primary branches such as the operating, accounting, engineering, mechanical and traffic departments, each with its specific duties, but these are again subdivided. Take the engineering department, for example. In the early days of American railways, all engineers in railway and other private employ were known as civil engineers to distinguish them from the military engineers. Later engineers dealing with motive power and machinery came to be known as mechanical engineers, while, with the development of electricity as a source of power, mechanical engineers specializing in the construction and operation of electrical machinery came to be known as electrical engineers. Even those remaining in the classification of civil engineers have been further divided until today the staffs of the chief engineers of large railways include men with titles such as engineer maintenance of way, engineer of construction, bridge engineer, engineer of buildings, engineer of water service and more recently such titles as engineer of grade separation, terminal engineer, engineer of track, landscape engineer, etc. As their titles indicate, each of these men concentrates his attention on the handling of a particular class of engineering problems, to the solution of which he brings highly specialized knowledge. Obviously, such a highly diversified organization is warranted only on the larger roads where specialized problems are of sufficient frequency to justify the employment of men to concentrate their attention on these various branches of engineering work. To meet the need for such services on the smaller roads where the creation of a specialized staff is not justified, numerous consulting engineers have established themselves, each specializing on a particular class of problems. More recently large engineering organizations have been created which are prepared to design and also to erect engineering structures. These organizations likewise specialize

in certain limited fields and thereby bring to the assistance of the railways, large and small, the best practices of all of the roads, assembled through their specialized organizations. This is, indeed, the day of specialization on the railways as well as in other industries. That management will profit which realizes the value of such service either regularly or occasionally as conditions warrant.

One of the Few Exceptions

The approval by the stockholders a week ago Thursday of the plan of the Delaware, Lackawanna & Western to issue a one hundred per cent stock dividend again brings into the lime light this interesting and unusual carrier. The occurrence seems to have come at a rather opportune time, for the Lackawanna, judging by its record so far this year, is out to prove itself a marked exception from its fellow railroads in this time of stress. The Lackawanna was one of the three or four roads shown in the operating statistics in last week's *Railway Age* as having carried more net ton miles in May this year than it did last year, in fact the net ton miles in the first five months this year have equaled those of the first five months of 1920. This is due to the manner in which anthracite coal traffic has held up and insofar as other traffic is concerned, it is largely the result of the work of an able traffic department and of a service on which the traffic department can count at all times. It, in turn, has resulted in a gross so far this year of $42,279,985 as compared with a gross in the first six months of 1920 of $34,767,373 and in a net railway operating income up to June 30, 1921, of $4,662,496 as compared with a net of but $612,543 in the same period last year. The net in June, 1921, was $1,395,173; in June, 1920, there was a net of $520,552. Most of the roads of the country which are showing increases in net this year as compared with last year have produced that result through savings in maintenance charges. This is not the case with the Lackawanna; its maintenance charges in June this year and in the first six months of 1921 as a whole have actually been considerably greater than in June or the first six months of 1920, respectively.

Use the Service Representatives

History does not record when the book agent first made his appearance on this planet. Possibly it was in the days of ancient Rome, for the Latin proverb "Let the buyer beware" proves that at that time people looked with suspicion upon the man who had something to sell. The relations between buyer and seller have improved in recent years. The vast majority of companies selling to railroads realize that the only satisfactory basis for a permanent business is to give service and keep costs down. The best example of the results obtained by co-operation between railroads and manufacturers are the service contracts which certain makers of supplies have with the roads. These companies are able to guarantee low costs because their experts observe practices on the road and see that materials are properly used. Some companies making appliances have tried to introduce a similar practice by having representatives check up the performance of their products and instruct the men in the proper methods of operation and maintenance, but in many cases the purpose of these men has been misunderstood and their work hampered by the inborn prejudice against the man who has something to sell. There is no reason for looking askance at the service representative. He is not an order taker; his sole function is to see that the railroad gets the most for its money, which should also be the object of every railroad officer and employee. If, because of a mistaken viewpoint, the local officers do not co-operate with the representatives of the supply companies, the railroad is the principal loser. Probably the best way to get the full benefit from service organizations is that adopted by the superintendent of motive power of a prominent road who has given these men a definite standing by issuing instructions to his subordinates pointing out that their experience with their particular specialty gives them an opportunity to offer valuable suggestions which should receive proper consideration.

"What the Traffic Will Bear"

WE HAVE RECENTLY BEGUN to hear much of the good old principle of basing railway rates on "what the traffic will bear."

Basing rates on "what the traffic will bear" formerly was advocated by railway officials as the soundest and fairest principle of rate making. The critics of railway management, and those who were seeking to prevent advances or secure reductions of rates, loudly decried this principle. Rates, they said, should be based not on what the traffic will bear—not on what the shipper could afford to pay—but on the expense incurred by the railroad in handling the traffic—on what the railroad could afford to take. If the traffic could bear certain rates, but the railroad by charging these rates could make more than a so-called "fair return," then the rates must not be charged. Railway officials contended that if the traffic could easily bear particular rates, or schedules of rates, this was proof of their reasonableness and fairness regardless of the profit the railroad made by charging them. This theory was made so odious to the public by attacks on it that railway officials almost ceased to advocate it.

Times have changed. Professional railway attackers, like Clifford Thorne and S. H. Cowan, after having for years denounced charging "what the traffic will bear" and contending that rates should be based on the "cost of the service," are now appearing before the Interstate Commerce Commission to contend that certain rates are too high solely because they are "more than the traffic will bear."

The question of the correct principles on which to make rates is presented with striking clearness and directness in the case before the Interstate Commerce Commission for reductions in the rates on live stock. Those who are seeking reductions in these rates are doing so entirely on the ground that if they are maintained the farmer cannot raise and ship live stock at a profit, and that therefore the rates should be reduced practically regardless of what it costs the railroads to transport live stock. This argument, unfortunately, is not entirely without foundation. The only reason why the railroads do not voluntarily reduce rates on live stock is that railway costs of operation are now so high. What makes them so high? Two-thirds of the present operating expenses consist of an excessive payroll; and the working conditions and wages which produce this payroll were first established by the Railroad Administration, one government body, and have since been continued by the Railroad Labor Board, another government body.

In other words, when the "cost of service" was mainly determined by railway officers and was low, Mr. Thorne, Mr. Cowan and other professional attackers of the railways contended rates should be based on the "cost of the service"—on what the railways could afford to haul the traffic for—and not on what the traffic would bear—on what the shipper could afford to pay. Now, however, when most of the cost of railway operation is fixed by government bodies and is high, Thorne, Cowan, et al., come in and contend that the rates should be based, not on the cost of the service—on what the railways can afford to handle traffic for—but on what the traffic will bear—on what the shipper can afford to pay.

When it was to the advantage of the railways to base rates on what the traffic would bear, Thorne, Cowan, et al., got the Interstate Commerce Commission and other regulating bodies to recognize and act on the principle that rates should be based mainly on the cost of the service. Now, when the cost of the service is high and the railways need to have rates based on this high cost, these same men appear before the regulating bodies and demand that rates shall be based not on the cost of the service but on what the traffic will bear!

The principle of basing rates mainly on what the traffic will bear always was the correct principle, and is the correct principle now. To refuse, however, to apply it when its application would increase the profits of the railways and then apply it when the railways are making practically no profits and its application would further reduce their already ruinously small net return, would be the height of imbecility and injustice. Besides, how could any government body base rates, as the Interstate Commerce Commission has in the past, mainly on the cost of rendering railway service when that cost was low owing to the good management of the railway companies themselves, and then refuse to recognize the cost of service when it was high mainly owing to the policies of government bodies deriving their authority from exactly the same source as the Interstate Commerce Commission?

It is exceedingly refreshing to hear people who in every rate hearing for years have denounced the railway managements as brigands because they advocated the principle of basing rates on "what the traffic will bear," now asking the Interstate Commerce Commission to ignore and forget all they have said upon the same point in the past and denouncing rates made by the Commission itself because they are not based on "what the traffic will bear." Meantime, we call the attention of these people and the Interstate Commerce Commission to two pertinent points. First, the Transportation Act directs the Interstate Commerce Commission to so fix rates as to yield the railways an average of 5½ per cent and the rates have not yet yielded this return—the law has not been carried out. Second, the Constitution of the United States is interpreted to prohibit confiscatory regulation, and the confiscatoriness of any general reduction of rates at present would be as palpable as the Washington Monument.

Locomotive Resistance Formulas

LOCOMOTIVE RESISTANCE is an important factor influencing the performance of motive power. It is necessary to determine the amount of this resistance in designing locomotives to haul a definite tonnage, in determining the maximum allowable grades, or in calculating the performance that can be expected from existing engines. Both mechanical engineers and civil engineers have given the matter attention and many formulas have been evolved to express the amount of resistance under varying conditions. The values for the resistance given by the several formulas vary widely, which is not altogether surprising, because the resistance is influenced by several variable factors. A graphic chart of the resistance as determined in numerous locomotive tests shows that there is a considerable variation in the resistance when expressed in terms of the weight on drivers which should, of course, be considered in evolving a general formula. On the other hand, a chart of the numerous formulas shows that some give values which are consistently lower than the experimental results, while others are much higher. As the maximum resistance is several times as great as the minimum, a mean value is not satisfactory.

The problem of determining the resistance of a locomotive with a fair degree of accuracy under all conditions is discussed in an article by Kiichi Asakura, mechanical engineer of the Japanese Government Railways, published elsewhere in this issue. By plotting a large number of experimental results, Mr. Asakura shows that the resistance apparently is not a function of either speed, cut-off, or mean effective pressure in the cylinders. It is only when the resistance is expressed in terms of mechanical efficiency at various speeds and at various cut-offs that consistent results are secured.

When the resistance is expressed in terms of mechanical efficiency, the available tractive effort can not be obtained as readily as when the resistance is given in pounds per ton of weight on drivers. To apply the mechanical efficiency, it is necessary to compute the output on a horsepower basis by using charts showing the steam consumption per drawbar horsepower hour. This method, however, has certain advantages because it brings out the fundamental relations between steam consumption, power and locomotive resistance under the condition being investigated. For instance, it is interesting to note that the lowest steam consumption per indicated horsepower hour occurs at the shortest cut-off of 20 per cent and the highest speed, 320 r.p.m., but on the basis of drawbar horsepower hour, the maximum economy occurs at 35, 40 or 45 per cent cut-off and at 160 to 200 r.p.m. In making an analysis of locomotive tractive effort, it is useful to have these factors brought out as a step in the final process.

The method suggested by Mr. Asakura complicates the calculations involved in finding the tractive effort and also introduces variables due to differing degrees of superheat and variations in boiler pressure. Basing the tractive effort on horsepower output and mechanical efficiency is more logical in the light of the data presented. Its advantages in actual practice over the method in common use can only be determined by a careful comparison of the results obtained by the two methods under varying conditions.

El Paso & Southwestern

THE EL PASO & SOUTHWESTERN is a comparatively small road, but withal a rather important one. It is controlled by the Phelps-Dodge interests, the products of whose mines it carries. It has strong financial backing, has a position of great strategic value as the connection between the lines of the Southern Pacific and those of the Chicago, Rock Island & Pacific and is noted for its efficiency of operation. The lines of the El Paso & Southwestern total 1,028 miles. They extend from Tucson, Ariz., eastward above the Mexican border south of and parallel to the line of the Southern Pacific as far as El Paso, Tex., and thence north into New Mexico as far as Dawson, connection being made with the Rock Island at Tucumcari.

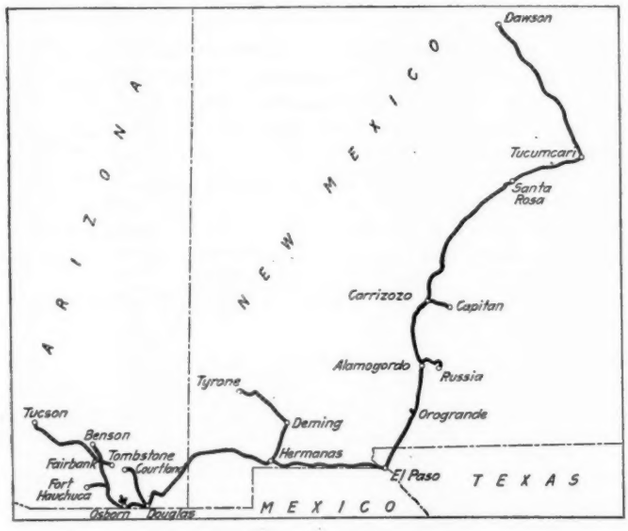
The traffic of the El Paso & Southwestern is predominantly ores. Of the total tonnage of 4,692,401 carried in 1920, 1,477,145 tons were ores; 698,989 tons, bituminous coal and 614,693 tons, products of agriculture.

The El Paso & Southwestern is more properly regarded as a system rather than as a single railroad. The parent company is known as the El Paso & Southwestern Company. The lines east of El Paso are known as the eastern division. They are composed of a number of railroads, all the stock of which is in the hands of the El Paso & Northeastern Company, a holding company only, control of which is held by the El Paso & Southwestern Company through entire stock ownership. The lines of the several railroads are also leased by the El Paso & Southwestern Company. The lines west of El Paso, comprising the western division, are owned by still another company, the El Paso & Southwestern Railroad Company. This company controls two smaller companies through stock ownership and all of its own stock is held by the El Paso & Southwestern Company. In addition

to this somewhat complex organization, the El Paso & Southwestern Company also owns all the stock of the Morenci Southern and the Nacozari Railroad and 50 per cent of the stock of the Tucson, Cornelia & Gila Bend. None of these three companies, however, is included in the El Paso & Southwestern System.

The El Paso & Southwestern in 1920 did an extremely heavy business. Its net railway operating income, however, for the year was $2,910,006 as compared with $2,993,415 in 1919. The figure for both years was about $1,000,000 under the average earnings for the test period. In 1918, the system earned over $1,000,000 more than its government rental. The corporate income for 1920, taking into consideration the standard return for January and February and the guaranty for the guaranty period showed a net income available for dividends of $1,097,314 as compared with $3,128,710 in 1919 or $3,551,700 in 1918. Dividends are paid at the rate of 8 per cent annually and total $2,000,000. To pay these dividends in 1920 the company had to call upon its surplus account.

The extreme dullness in the metal markets at the present time has been sharply reflected in the El Paso & Southwestern traffic and earnings, at least up to April or May,



The El Paso & Southwestern

1921, the figures for which months are the latest at present available. The gross earnings for the first five months of 1921 were $4,977,296 as compared with $5,801,581 in the first five months of 1920. The net railway operating income of $178,948 in the first five months of 1921 compares with $1,218,809 in the same period of 1920. The traffic has been running at about 75 or 80 per cent of the 1920 average. With this falling off in traffic, the company has naturally not been able to keep up its train loading, car loading, etc., at the 1920 average. The average net tons per train in the first four months of 1921 were 528; in the first four months of 1920, 555; in 1920 as a whole, 585. The net ton miles per car day, which figure takes into consideration, car load, car miles per day and per cent of loaded to total car movement, were in the first four months of 1921, 555; in the first four months of 1920, 706; in 1920 as a whole, 740. A new figure in the operating statistics which is being given increasing importance is that of net ton miles per train hour, which takes into consideration not only train load but train speed. In the first four months of 1921 the El Paso & Southwestern's average of net ton miles per train hour has been 7,969 as against an average for the central western region of 7,011 or an average for the entire country of 7,056. Bad order cars in April were but 5.0 per cent, or considerably below the average.

The El Paso & Southwestern will likely show improvement in its earnings in the June and July figures. It has been carrying a large portion of the cantaloupe traffic from southern California to Chicago and eastern points, profiting thereby from its being the connection between the Southern Pacific and Rock Island.

The operating results for 1920 as compared with 1919 are as follows:

	1920	1919
Mileage operated	1,028	1,028
Freight revenue	$11,212,405	$9,983,206
Passenger revenue	2,705,268	2,196,839
Total operating revenue	14,872,614	12,761,391
Maintenance of way expenses	2,835,948	2,290,443
Maintenance of equipment	2,843,758	2,528,666
Traffic expenses	241,017	120,726
Transportation expenses	4,219,057	3,542,638
General expenses	543,957	309,643
Total operating expenses	10,806,319	8,886,443
Net revenue from operation	4,066,295	3,874,948
Taxes	1,252,954	724,181
Railway operating income	2,812,601	3,149,989
Net railway operating income	2,910,006	2,993,415
The corporate income account is as follows:		
Compensation for lease of road	$689,186	$4,135,114
Gross income	3,524,814	5,599,094
Deduct—Rent for leased roads	1,948,859	1,927,032
Total deductions from gross income	2,474,500	2,470,384
Net income	1,097,314	3,128,710
Dividend appropriations of income	1,097,314	2,000,000

St. Louis-San Francisco

THE ST. LOUIS-SAN FRANCISCO is at present handling about 25 per cent less traffic than it handled over its lines in the early part of 1920. In no month up to and including May this year have the net ton miles even equaled the total for April, 1920, in which month the road had to contend with the outlaw strike. The gross revenues of the St. Louis-San Francisco itself (4,760 miles of the system's total of 5,253) in the first five months of 1921 were $33,544,308 as compared with $34,974,331 in the same months of 1920. Through reductions in operating expenses, chiefly in decreased expenses for maintenance of way and structures and for equipment, the company has been able to increase its net nearly 50 per cent over the net in the first part of last year. The net railway operating income for the first five months of 1921 was $6,514,797; for the same period in 1920, it was $4,350,552.

The St. Louis-San Francisco is being looked upon with increasing favor in financial circles, for which various reasons may be assigned. Probably the most interesting feature is the outlook for the cumulative adjustment mortgage bonds due in 1955 and the income bonds due in 1960. The former issue totals $39,219,643; the latter $35,192,000; both pay interest of 6 per cent if earned, the total interest charges for the two issues being $4,464,699. This interest has been paid regularly since the reorganization in November, 1915. The total funded debt of the St. Louis-San Francisco is $282,940,676, on which interest charges total $13,999,286. It appears that even with the decline in traffic with which the system is at present confronted, it should be able in 1921 to meet these charges.

Except as concerns the present depression in business and the falling off in railway traffic resulting therefrom, the St. Louis-San Francisco has been characterized in recent years by a steady growth in traffic and by increased operating efficiency which this larger business has permitted. The increase in traffic has been reflected in progressively higher figures of revenue tons carried as well as of revenue ton mileage. The road has been able to secure a longer haul, an increasing car load and an increasing train load. Its passenger business has similarly improved, with a larger number of passengers carried, a greater passenger mileage, a larger average journey, a greater number of passengers per car and

per train. The year 1920 was the busiest in the company's history. It carried 24,718,345 revenue tons of freight; the ton mileage was 4,621,380,827. The average haul was 187 miles; the revenue car load 23.44 tons and the revenue train load 398 tons. For purposes of comparison it might be noted that the average car load in 1916 was but 19.24 tons and the average train load, but 337 tons.

Naturally the revenues have shown an increase in greater ratio than that of increase in traffic handled. The St. Louis-San Francisco did fairly well for the government during the period of federal control although it was unable to keep up this record during the guaranty period. It earned close to its standard return in 1918; in 1919 its net railway operating income exceeded the government's rental. In 1920, however, the net railway operating income ran nearer one-half the average for the test period. As far as 1920 was concerned, the St. Louis-San Francisco, despite its record traffic, higher rates and increased gross, was no exception from most of the railroads of the country. Except as far as 1920 is concerned, therefore, the road seems to have been making good in a rather decent manner. The way in which so far this year it is earning its fixed charges despite the small amount

The St. Louis-San Francisco

of traffic handled, seems to augur well for the future when business conditions are restored to a more normal level.

The St. Louis-San Francisco is a system of 5,253 miles, of which the St. Louis-San Francisco itself constitutes 3,545 miles; the Kansas City, Fort Scott & Memphis, 926; the Kansas City, Memphis & Birmingham, 290; the Fort Worth & Rio Grande, 235; the St. Louis-San Francisco & Texas, 134, etc. In the monthly operating statistics referred to above, the first three roads are regarded as one line; in the annual report the figures given are for the entire system. This total mileage of 5,253 miles, as will be seen from the map, is contained in eight states, the two having predominantly the greater part of the mileage being Missouri and Oklahoma. Considering the extent of the area traversed by the Frisco lines, it is natural that its traffic should be greatly diversified. In 1920, products of agriculture made up 13.44 per cent of the total tonnage; products of animals, 2.12 per cent; products of mines, 39.42 per cent; products of forests, 12.39 per cent and manufactures, 28.47 per cent. Of the products of mines, considerably over half was bituminous coal which constituted 24.24 per cent of the road's total tonnage. Of manufactures nearly half was refined petroleum and its products, which made up 12.44 per cent of the total traffic carried by the system. As compared with the 1919 totals, the increase in coal and petroleum products is especially noteworthy.

The decreased traffic so far this year has prevented the St. Louis-San Francisco from realizing the operating efficiency which characterized it during 1920. The savings which have permitted a greater net in the first five months of 1921 than in the first five months of 1920 have been in maintenance rather than in transportation expenses, which is, of course, the normal condition to be expected in the early part of a period of decreasing traffic. In May, the road—we refer to the St. Louis-San Francisco as a road of 4,761 miles rather than as the system of 5,253—secured a figure of net tons per train of 425 as compared with 448 in 1920 as a whole. It is to be noted that this figure is increasing each month; in January, the net tons per train were 387. The car load in May, 1921, averaging 24.5, compared with an average for all of 1920 of 26.1; the net ton miles per car day in May was 314; in 1920, 371. Despite the savings in maintenance of equipment, the Frisco has kept its hands on the bad order car situation in good shape. The percentage of bad order cars in May was 6.3, a decrease from preceding months. This average of 6.3 per cent compares quite favorably with the bad order car situation on the country's railroads as an average.

The St. Louis-San Francisco received from the government 33 of the standard light Mikado and 7 light switching locomotives and 3,500 double-sheathed, 40-ton box and 1,000 50-ton gondola cars. During 1920, the company also purchased from the War Department at a price of $25,000 each, 10 of the Decapod locomotives originally built for the Russian government, making a total of 20 such locomotives in service at the end of the year. On the whole it would appear that the system has improved its situation as to equipment rather materially through these acquisitions.

The operating results in 1920 as compared with 1919 are as follows:

	1920	1919
Mileage operated	5,253	5,252
Freight revenue	$66,338,922	$53,558,494
Passenger revenue	26,341,511	23,599,251
Total operating revenue	98,723,040	82,202,919
Maintenance of way expenses	18,389,537	13,051,814
Maintenance of equipment	23,501,539	16,085,236
Traffic expenses	995,110	709,440
Transportation expenses	44,116,333	31,852,973
General expenses	3,148,968	2,524,107
Total operating expenses	89,886,545	64,069,624
Net operating revenue	8,836,495	18,133,295
Taxes	3,533,514	2,789,445
Operating income	2,899,565	14,176,271

The corporate income account which follows shows that the company was able in 1920 to meet the interest charges on its cumulative adjustment bonds and on its income bonds and still have a balance of $1,743,231 to be credited to profit and loss account:

	1920	1919
Standard return, January and February, 1920; full year 1919	$2,270,838	$13,415,510
Guaranty period, March 1 to Aug. 31	6,812,514	
Increased compensation on account of additions and betterments	705,685	
Difference between tentative standard return taking into account and standard return as finally certified January 1, 1918-December 31, 1919.	419,034	
Net operating income September 1 to December 1, 1920. (Less corporate expenses for months of January and February, 1920	5,536,517	
	$15,744,588	
Total other income	597,498	$524,251
Gross income	$16,342,086	$13,939,762
Total deductions from income	515,680	758,574
Balance available for interest, etc	$15,826,406	$13,181,188
Interest on fixed charge obligations	9,630,761	8,894,825
Interest on cumulative adjustment bonds	2,340,894	2,326,895
Interest on income bonds	2,111,520	2,111,520
Balance	1,743,231	152,052

Railroad Settlement Plan Announced by President

Railroad Indebtedness to Government to Be Funded and Roads Surrender Part of Claims to Expedite Adjustment of Some $500,000,000 Due to Them

WASHINGTON, D. C.

THE PLAN FOR FUNDING the indebtedness of the railroads to the Railroad Administration for additions and betterments, and for expediting the settlement of the Railroad Administration's indebtedness to the railroads on a compromise basis by which the roads waive their claims on account of the inefficiency of labor, as outlined briefly in last week's issue of the *Railway Age*, was informally announced by President Harding on July 22 and on July 26 he sent a message to Congress proposing a method for providing the funds needed to pay the railroads without an additional appropriation for the Railroad Administration. Congress was asked to extend the authority of the War Finance Corporation so that it may purchase the 10-year secured and negotiable promissory notes to be given by the railroads to the Railroad Administration and use them as the basis of credit by which to raise the additional funds which the Railroad Administration will need in order to settle its obligations to the roads, estimated at some $500,000,000. Part of that amount it has available from its former appropriations.

President Harding in his message also suggested "the very promising possibilities of broadening the powers of the War Finance Corporation for the further relief of agriculture and live stock production."

The President's Message to Congress

The President's message, in which he described the agreement reached with the railroad executives, was as follows:

To the Senate and House of Representatives:

It is necessary to call the attention of Congress to the obligations of the government to the railroads, and ask your co-operation in order to enable the government to discharge these obligations. There is nothing new about them, but only recently has there come an understanding which seems well to justify a sincere endeavor to effect an early settlement. These obligations already have been recognized by the Congress, in the passage of the Transportation Act restoring the railroads to their owners, but previous recognition was made in the contract under which the railroads were operated by the government for the period of the World War.

The contract covering operation provided that the railways should be returned to their owners in as good condition as when taken over by the government, and the Transportation Act, recognizing that betterments and additions belong to capital account, provided that such sums as the railway companies owed the government for betterments and new equipment, added during the period of government operation, might be funded. There has been, at no time, any question about the justice of funding such indebtedness to the government. Indeed, it has been in progress to a measurable degree ever since the return of the railroads to their owners. It has been limited, however, to such cases as those in which final settlements with the railway administration have been effected. The process is admittedly too slow to meet the difficult situation which the owners of the railroads have been facing, and I believe it essential to restore railway activities and essential to the country's good fortune to hasten both funding and settlement.

Quite apart from the large sums owing to the government, which we are morally and legally bound to fund, the government admittedly owes the railway companies large sums on various accounts such as compensation, depreciation and maintenance. There has been a wide difference of opinion relating to the amount the government owes, due in the main to the claim of the owners that in spite of materials and hours of labor being estimated in proper relations to similar expenditure in the pre-war test period, the "inefficiency of labor" still left a wide difference between actual up-keep and the expenditure made during the government operation.

A Moral and Contractural Obligation

In order to expedite settlement and funding an informal understanding, which is all that is possible or practical, has been reached, under which the railway claims based on the "inefficiency of labor" are to be waived to hasten complete and final settlements, without surrender of any rights in court in case there is failure to settle. I have no doubt that early, final and satisfactory settlements will be reached, since the policy of the railway administration already has been effective in finally settling the accounts of roads filing claims amounting to $225,568,764, resulting in the payment to them of $68,141,222.

The way now would seem to be clear to very early adjustment and relief, except for the fact that the railway administration, though possessing assets, does not command the funds necessary to meet what will be its admitted obligations.

There is no thought to ask Congress for additional funds. Perhaps $500,000,000 will be necessary. The Railroad Administration has, or will have in the progress of funding, ample securities to meet all requirements if Congress only will grant the authority to negotiate these securities and provide the agency for their negotiation.

Congress Asked to Extend Authority of War Finance Corporation

With this end in view you are asked to extend the authority of the War Finance Corporation so that it may purchase these railway funding securities accepted by the director general of railroads. No added expense, no added investment is required on the part of the government, there is no added liability, no added tax burden. It is merely the grant of authority necessary to enable a most useful and efficient government agency to use its available funds to purchase securities for which Congress already has authorized the issue, and turn them into the channels of finance ready to float them.

I can readily believe that so simple a remedy will have your prompt sanction. The question of our obligation can not be raised, the wisdom affording early relief is not to be doubted, and the avoidance of added appropriation or liability will appeal to Congress and the public alike.

The after-war distresses of two great and fundamental activities have been riveting the anxious attention of the country. One is the readjustment and restoration of agriculture, the other is the distress of our railway transportation system.

Pending proposals for relief and their discussion have already brought to the attention of Congress the very promising possibilities of broadening the powers of the War Finance Corporation for the further relief of agriculture and live stock production. This corporation has proven itself so helpful in the relief thus far undertaken, that I can not help but believe that its broadened powers, as have been proposed, to meet agricultural needs, will enable it wholly to meet the nation-wide emergency. This is an impelling moral obligation to American farming in all its larger aspects, and it will be most gratifying to have your early sanction.

A Moral and Contractual Obligation

In the case of the railroads there is a moral and a contractual obligation, and your favorable action is no less urgent, and will no less appeal to public approval. Railway solvency and efficiency are essential to our healthful industrial, commercial and agricultural life. Everything hinges on transportation.

After necessary and drastic curtailments, after harrowing straits in meeting their financial difficulties, the railways need only this financial aid which the fulfillment of our obligations will bestow, to inaugurate their far-reaching revival. Its effects will be

felt in varied industries, and will banish to a large degree the depression which, though inevitable in war's aftermath, we are all so anxious to see ended.

I am appending herewith memoranda concerning the progress of railroad liquidation and revealing existing conditions which Congress will be interested to note, while considering the simple remedy proposed for the relief of the situation. The information is submitted by the director general of the railroads.

Plan Accepted by Railroads Last Week

The compromise proposed by the President, who was represented in the negotiations principally by Secretary Hoover, was accepted at a meeting of the member roads of the Association of Railway Executives in New York on July 20 by the adoption of a short resolution. The result was not announced by the executives but was reported to Mr. Hoover on the following day by Alfred P. Thom, general counsel for the association, and then communicated to the President.

Before undertaking to fund the indebtedness of the roads to the government on capital account, which the President was authorized to do in his discretion under the Transportation Act, he thought the railroads ought to facilitate the final settlement of the other accounts by removing the principal cause of controversy. In the settlements which the Railroad Administration has been making so far it has steadfastly refused, with the full approval of the President, to allow anything on account of inefficiency, but the controversy has delayed the negotiations and many roads have not yet filed their claims because of the length of time required to make up their case on that basis. The administration is anxious to close up the Railroad Administration, which is a rather expensive organization, at the earliest possible date, and it has also been anxious to pay to the railroads as promptly as possible the sums which it considers fairly due them, partly for the influence which it is believed such payments will have on the general business situation. In asking the roads to waive this feature of their claims the President promised on his part to do everything possible to expedite the settlements. The President is convinced that there is some ground for the contention of the railroads that it was not sufficient to measure the government's maintenance obligation on the expenditures made without reference to the fact that even an equation for the increased rate of wages did not cover the same amount of work that was performed for the wage in the test period, but he has also taken the position that the government cannot go into a fine analysis of a question that is so difficult to prove quantitatively. He also recognizes that the railroads have not been fairly treated as a result of federal control in that the government drew very heavily on the service life of their rolling stock and other property, although he has been convinced as a result of his conferences on the subject in the last few weeks that the railroads have filed some rather extravagant claims. The President is now rather pleased with the whole situation.

Any railroad that is not willing to negotiate on the compromise basis will not receive the benefit of having its capital expenditures funded, but it is understood that the roads that have already settled will receive the same treatment that the others receive as to funding. Although it will require time to negotiate the individual settlements the funding operation will make it possible for the Railroad Administration to pay out undisputed items on account which will release some ready cash to some of the roads very soon.

The memorandum from Director General Davis regarding the progress of railway liquidation, which also describes the reasons for the adoption of the new plan, was as follows:

Director General Outlines Progress of Railway Liquidation

The total number of federal controlled carriers, including subsidiary companies, was 425. The mileage of the federal controlled roads was 239,009.

The number of claims on final settlement filed with the director general up to July 15, 1921, was 184, the aggregate amount claimed being $758,032,235. The mileage of the roads that have filed their claims aggregates 167,070.

The amount of claims settled by the director general up to and including July 15, 1921, aggregated $225,568,764. These settlements represent some 43 per cent in number of the claims actually filed. The total amount paid in settlement was $68,141,227.

The largest single disputed item in final settlement is the claim for undermaintenance of way and structures and equipment. The undermaintenance claims represent more than 50 per cent of the total amount of claims filed. Included in these claims for undermaintenance is the much discussed claim variously described as "inefficiency of labor," "ineffectiveness of labor," or "the difference in the cost of applied material as between the test and federal control periods," this item representing some 70 per cent or 75 per cent of the total undermaintenance claims.

Claims for inefficiency of labor have not been allowed by the Railroad Administration, not only, as contended by the Railroad Administration, because such claims are not contemplated by the standard contract, but they are of a too highly indefinite, speculative and contingent character to warrant consideration.

In addition to the claims on final settlement, covering the various items of dispute between the carriers and the administration, there are innumerable claims for loss and damage in the transportation of freight, fire and personal injury cases, and reparation claims growing out of freight rate controversies. These claims are being rapidly disposed of, and within a reasonable time the adjustment of same should be completed.

During the period of federal control there was expended by the Railroad Administration, on behalf of the carriers, some $1,144,000,000 in additions and betterments, properly chargeable to capital account. Of this sum in excess of $381,000,000 was used in the purchase of additional equipment, consisting of 100,000 box cars and 2,000 locomotives, and the expenditure for this equipment has been taken care of in equipment trust certificates now held by the Railroad Administration. This leaves about $763,000,000 of additions and betterments which, if not funded, must be deducted from the amount due from the Railroad Administration to the carriers in final settlement. "An extension of the time in which these addition and betterment obligations could be paid, to such carriers as could give reasonable and satisfactory security, would enable the carriers recovering this extension to expend this amount of money in the much needed rehabilitation of their cars and locomotives, and apply the usual and necessary maintenance upon their way and structures, so that the national system of transportation could be equipped during the coming fall and winter to promptly and effectively perform its duty to the public in the way of prompt and efficient transportation.

Bad Order Freight Cars and Locomotives

The percentage of bad order freight cars has not been below 5 per cent at any time during the past five years. During the year 1917, it ranged between 5.2 and 6 per cent. While there is no general agreement as to what the normal percentage should be, it seems to be generally accepted at from 5 to 6 per cent. The percentage of bad-order cars on July 1, 1921, was 15.6 per cent, or about 10 per cent above normal. The total number of freight cars in service at the present time is about 2,400,000, and 10 per cent of that number would be 240,000, which represents the excess or abnormal, bad-order condition of freight cars today.

The normal percentage of bad-order locomotives is understood to be 10 per cent. The percentage of bad-order locomotives on July 1 was 23.9 per cent, or 14 per cent above normal. The total number of freight and passenger locomotives (exclusive of switching) is about 50,000, and 14 per cent of this would be 7,000 locomotives, which represents the abnormal bad-order condition of locomotives at the present time.

Deferred Maintenance

The amount of deferred maintenance at the present time has been conservatively estimated at $400,000,000, of which $200,000,000 represents maintenance of way and $200,000,000 maintenance of equipment. That is, these are the amounts which should be expended on the railway properties to bring them up from their present physical condition to normal.

Shortage in Number of Railway Employees

The total number of railway employees in the first quarter of 1921 was 1,691,471. This was less by 340,456 than the average

number in 1920, and less by 302,053 than in the first quarter of 1920.

This manifestly means an enormous increase of unemployment. If the railroads were in a position to resume their normal maintenance of ways and structures and equipment it is conservatively estimated that it would mean immediate employment of at least 200,000 workmen.

Delayed Payments of Vouchers

Delayed payments of the current liabilities of the railways, representing principally payments due for fuel and materials used in operation, have been conservatively estimated at not less than $300,000,000.

The failure to pay these has involved great industrial distress and depression. It has meant the shutting down of many industries. If the railroads are paid what is due them by the government, they in turn can pay these debts, and the starting up of industry will be enormously assisted and promoted.

It is evident, if the products of our farms, of our forests, of our mines and of our other industries are to find a way to market, that our railroads must be adequately equipped to move them. Manifestly, from the foregoing statistics, they are not now so equipped. If there is to be a return, as we devoutly hope there soon will be, of normal business activity and prosperity, it must not be halted and obstructed by insufficient transportation, which is a fundamental condition of all commerce.

Funding

By the terms of Section 6 of the Federal Control Act, the President was authorized to incur, on behalf of the carriers, indebtedness for additions and betterments. To create an indebtedness to be paid by others without limit in amount is, it must be admitted, a most unusual power and was justified only by the exigencies of war.

As a result of the exercise of this power, a large amount of indebtedness was created by the director general, and imposed upon these carriers, for additions and betterments, some of it assented to by them, and some of it not concurred in. This class of indebtedness, although on capital account, was made by the government immediately payable, instead of being arranged as long-time obligations.

If the carriers had been dealing with their own affairs in respect to additions and betterments, it is reasonable to suppose that they would not have undertaken to provide for these large capital requirements out of their current income, but would have followed their usual course, which would have been not to incur indebtedness, as to a large part of this amount, until they had succeeded in financing the capital required on long-term obligations. They could not do this under the conditions of federal control and of the war, for the two reasons: First, because the matter was not legally within their control, and, second, because the entire investment market was necessarily absorbed by the government in securing war loans.

The question, therefore, arises what it is equitable and just to do now in regard to the adjustment of this indebtedness? The carriers insist that it should be funded by the government for a term of at least ten years.

This, they claim, is just, not only because of the circumstances above narrated under which the indebtedness was created, but for an additional reason in which the public, as well as the carriers themselves, have an interest. The carriers at the end of federal control had been out of the possession of their properties for more than two years. They were called upon at that time to resume the responsibility of furnishing transportation adequate to the needs of commerce. It must be admitted that they undertook the performance of this duty under adverse conditions. Their organizations had been broken up; much of the normal traffic of the various lines had been diverted to others; their rolling stock had been widely scattered by government management throughout the country, and their labor expenses had been enormously increased during federal control. This situation, they claim, put upon them the necessity of providing for abnormal expenses of operation at the very outset.

It is in the public interest that they should be able to perform successfully the duty of transportation. This will necessitate not only an adequate supply of cash for their abnormal expenses, due to the special conditions which have surrounded their properties, and for their current purposes, but also will necessitate the borrowing of large amounts of new capital, so as to keep their roads up to the requirements of the public, and for other capital purposes, such as the payment of maturing obligations. This they will have to do in a market disturbed by war conditions, and where there is a tremendous competition, as between themselves and with other industries, for the funds available for investment.

It is even more vital to the public than to the carriers, that the carriers should succeed in securing the money necessary to the successful performance of their transportation duties.

If the government refuses to fund this indebtedness which it created for the carriers, and for which the Transportation Act expressly provided, and if, in addition to their large capital requirements for other purposes, it is necessary for them to borrow also the amount they owe the government for additions and betterments, their problem and the public's problem in respect to transportation will be enormously embarrassed.

The indebtedness of the carriers to the government for additions and betterments incurred under the circumstances above mentioned, ought not to be allowed to constitute an additional complication and embarrassment in this situation. To avoid this, the government ought not to hesitate to carry this indebtedness for ten years, as provided in the Transportation Act, in view of the fact that the reason it was made immediately due grew out of the war and the public needs.

Plan Is a Compromise

The plan as adopted is a victory for the Railroad Administration in that it practically recognizes its position on the interpretation of the provisions of the standard contract governing the government's obligation to maintain the railroad properties, but it does not foreclose any legal rights of the railroads if they desire to or can afford to delay a settlement while seeking to enforce their contentions in the courts. As a practical matter, however, the concession that they are making represents the surrender merely of a claim on which they have been given full notice that they would have the greatest difficulty in collecting. It is said in some quarters that the railroads have been led to prepare claims on what the administration terms an extravagant basis by the fact that Director General Hines publicly insisted on several occasions that any undermaintenance on some roads would be, if anything, more than offset by overmaintenance on other roads and there was a general impression that the administration intended to make some heavy counter-claims against the roads for overmaintenance. In view of such a position on the part of the Railroad Administration it would not be surprising if many of the railroads had prepared their claims on a "fighting basis."

All sorts of figures have been given as estimates of the amounts of money involved in the various phases of the proposed settlement but they cannot be stated exactly for several reasons. The Railroad Administration has made no formal report since the expiration of federal control and the accounts between it and the roads are greatly complicated by many items as to which there are claims on both sides and as to which the conflicting figures cannot be checked in a short time. A large percentage of the claims have not been filed and those which have not been made will probably now be made on a more conservative basis than those filed heretofore, while presumably some roads have already been more conservative than others. Claims to the amount of $758,000,000 have already been presented and on the basis of these Director General Davis has estimated that the aggregate would be about $1,250,000,000, of which approximately $700,000,000 to $800,000,000 would be for undermaintenance and a large percentage of which would be based on the inefficiency of labor, although the claims do not state any definite item of that kind. If this factor is eliminated the claims might be reduced by $400,000,000 to $600,000,000, which would still leave a considerable margin of difference between the Railroad Administration's idea of what it fairly owes the roads and their idea of what they should receive. The amount which the government expects to pay has been variously stated at $300,000,000 to $500,000,000. Up to date it has settled with about 75 roads, on a basis which includes in some cases an allowance on account of undermaintenance. The administration is not adhering to Mr. Hines' contention that the government does not owe anything for undermaintenance. As a large proportion of the roads that have settled are the smaller roads perhaps the settlements already made

are not exactly typical but they include half a dozen or so of the larger systems.

Amount Involved in Funding Arrangement

The amount to be involved in the funding operation is somewhat more definite but is by no means exact. The Railroad Administration expended for capital improvements on the railroads about $1,144,000,000, of which nearly $400,000,000 was for the standard equipment, of which some has been paid for in cash and $310,000,000 was funded by car trust certificates during Mr. Hines' administration. That left approximately $763,000,000 for additions and betterment, part of which have been paid for in cash or offset against other accounts, and part of which has already been funded. A part will not be funded because some roads will prefer to pay up and some roads will not be able to furnish adequate security. It is estimated therefore that the government will accept the railroads' negotiable 10-year promissory notes, secured by mortgage bonds, for about $500,000,000 to $600,000,000.

Great Northern as Concrete Example

A concrete example of how the funding operation is expected to work in the case of a road that has already settled with the Railroad Administration is described in an application filed with the Interstate Commerce Commission by the Great Northern for a loan of $15,000,000 to repay a loan of like amount maturing on September 1. The company states that it has made a settlement with the Railroad Administration in which the director general set off against the amount due the company $16,997,642 due the government for additions and betterments. The company asked to have this amount funded but its request was denied on the ground of the general policy of the Railroad Administration and the limitation of its funds. The company had hoped to use this money to repay the loan. It has now been assured by the director general, the application states, that in the event the general policy shall be changed and funds are put at the disposal of the director general to enable him to fund the additions and betterments for the roads generally the director general will refund in whole or in part the $16,997,642 which was withheld at the time of the settlement and the company was informed that plans were under consideration whereby funds were to be placed at the disposal of the Railroad Administration for the purpose of refunding for the railway companies whose properties were under federal control the amounts due to the United States on account of additions and betterments. The company therefore proposed that the loan of $15,000,000 be made for five years with a provision that not to exceed $10,000,000 of it should become due and payable when funds are received from the director general.

Requests Short Line Claims Be Expedited

President Robinson of the American Short Line Railroad Association called on the President last week and urged that the settlement of the short line claims for some $25,000,000 also be expedited.

How soon action may be had in Congress on the President's recommendation appears somewhat uncertain It bumped into politics at the start. A bill had been drafted by Secretaries Mellon and Hoover and Managing Director Meyer of the War Finance Corporation to extend the powers of the corporation with reference to railroads, agriculture and exports all at the same time but opposition developed promptly in the so-called "agricultural bloc" in the Senate and Senator Curtis of Kansas called at the White House on Monday to protest vigorously against coupling the relief for the farmers with the plan for financing the railroad settlements. Apparently the agricultural interests that have been complaining bitterly about high freight rates would rather have the railroad matter treated in a separate bill where they could point to the railroads as attempting to "raid the Treasury." Probably the plan for combining the three plans in one bill was inspired in part by a desire to conciliate the various interests, but at any rate when the bill was introduced in the Senate on Tuesday by Senator Kellogg, as a substitute for the Norris bill to create a separate $100,000,000 corporation to finance agricultural exports, the railroad part of it was left out, and it was stated that it would be put into a separate bill. The President's message was then referred to the Senate committee on interstate commerce which is expected to formulate a bill. Chairman Cummins of the Senate committee is out of the city. The Kellogg bill would authorize the War Finance Corporation to extend credits to promote agricultural exports. The War Finance Corporation has announced that it has on hand a cash credit with the Treasurer of the United States of $403,827,771.

Missouri & North Arkansas Discontinues Operation

OPERATION of the Missouri & North Arkansas will be discontinued on July 31, following a long series of difficulties which culminated recently in a strike of the employees. The company has been operating 364 miles of line between Joplin, Mo., and Helena, Ark., of which it owned 335 miles, and leased 29 miles. In addition, the company has an equal joint ownership in the Joplin Union Depot Company. The Missouri & North Arkansas was chartered in August, 1906, for 50 years, and was a reorganization of the St. Louis & North Arkansas, a line which had been constructed originally to tap a lumber region in southern Missouri and northern Arkansas. The reorganized company, however, was forced into a receivership in April, 1912, and has not been out of the jurisdiction of the courts since that time. Up to December 31, 1919, the property had incurred a deficit of $956,482.

In March, 1920, C. A. Phelan, general manager of the road, was appointed receiver. Recognizing the need for drastic economy, the receiver ordered wage reductions effective February 1, 1921. The reductions were immediately contested by the employees of the company, who took the controversy before the Labor Board, and when the board remanded the dispute to conference between the management and representatives of the men the latter immediately notified officers of the road that the employees would walk out unless the wage reduction order was rescinded. This threat materialized on February 27, when the enginemen, trainmen, telegraphers and station agents left their work. The strike has been attended with considerable violence and has never been settled, although traffic was resumed on March 24, after a tieup due to destruction of the road's property by strikers. C. A. Phelan resigned as receiver on July 14 and J. G. Murray, traffic manager, was appointed in his place. The new receiver immediately encountered difficulty in raising the July payroll of $28,000, and announced on July 22 that operation of the road would be discontinued. The abandonment of the Missouri & North Arkansas will leave five counties in northern Arkansas entirely without railroad facilities.

While the plan of the receiver for discontinuing operation has been definitely approved by the federal court for the eastern district of Arkansas, business men in the region served by the road are making a final effort to prevent suspension. A meeting was held at Harrison, Ark., on July 26, to launch a campaign to raise $150,000 in order to guarantee the road's expenses for three months after July 31 in the belief that the crops and other products which will be moving at that time will enable the road to meet future expenses it will incur.

New Cornwall Railroad Shop Has Walls of Glass

Small Line Gives Unusual Attention to Light and to Layout of Unusually Complete Plant

By J. C. Childs
The Austin Company, Cleveland, Ohio

THE CORNWALL RAILROAD recently placed in operation a new locomotive repair and machine shop at Lebanon, Pa., which is of special interest as indicating the tendency of small industrial railroads to reduce their labor costs of locomotive repair or do away with the expensive methods of contracting for repairs. The Cornwall Railroad operates 13 miles of line out of Lebanon, Pa. Its chief business is the transportation of iron ore from the Cornwall ore banks to the furnaces of the Bethlehem Steel Company at Lebanon. The very nature of its business makes this line practically an industrial road and it is in fact a subsidiary of the Bethlehem Steel Company's local Lebanon interests.

The road's motive power consists of 13 locomotives varying in weight and size from the old 50-ton locomotive now used in passenger service to the modern 2-8-0 type locomotive weighing 165 tons. In addition to maintaining its own motive power the Cornwall Railroad also repairs all of the industrial locomotives used at the furnaces around Lebanon.

The road's engine terminal consists of a 10-stall square engine house and the locomotive repairs were formerly handled in a small back shop of frame construction, adjoining two stalls of the engine house. All of the work was done by hand with the use of small jacks so that a de-wheeling operation loomed up formidably as a day's job for the entire crew. Repairs to the road's heavy steel ore cars of 50 tons capacity are also made at the terminal so that in selecting the site for the new locomotive repair shop consideration was also given to improved conditions for the repair of cars.

The site finally selected is just back of and to one side of the present engine house so that when a two-stall addition is made to the engine house the outside stall track will become a through track leading into the new locomotive repair shop. The old locomotive repair shop becomes the car repair shop, and, with the blacksmith and forge shop located midway between the two departments, the whole becomes a compact and efficient arrangement for the work to be done.

The repair shop is 110 ft. wide by 162 ft. long and consists of a 60-ft. erecting aisle and a 50-ft. machine shop aisle. Owing to the many classes and the number of locomotives handled a longitudinal shop seemed the only logical one. The erecting aisle has two tracks on 25 ft. center, each with a pit and gives a track capacity for four of the largest locomotives at one time. The present tendency is for increasingly heavy locomotives, so that instead of the old style burdensome and expensive drop pits one track is fitted with a four jack, 200-ton, Whiting hoist, which, with the use of shop tracks, allows the full use of pit capacity. The erecting aisle is also served by a 35-ton crane operating the full length of the building.

The Walls of the Shop Building Are Almost Entirely of Glass

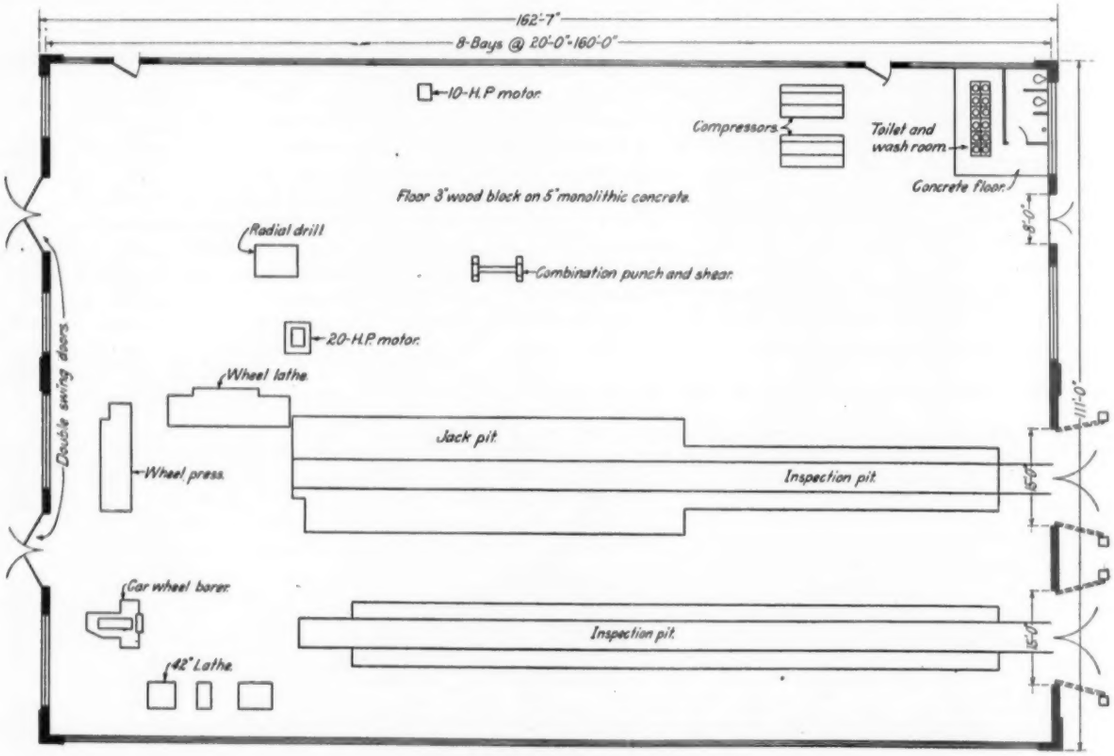
Due to the limited amount of money available it was decided to use one end of the erecting aisle for the heavy machine work so that it could all be handled by the crane, which accounts for stubbing the two pit tracks instead of running them clear through the shop. The wheel press, drill and lathe are all located in this end, leaving the machine aisle free for lighter operations not necessitating the use of a crane.

The present tendency in the design of large locomotive erection shops, where complete rebuilding operations will be done, is to allow approximately 4,000 sq. ft. of machine shop space per pit. The late Walter Berg in his book on Amer-

ican Railway Shop Systems recommended about 2,500 sq. ft. per pit. The Cornwall shop was not designed for complete rebuilding operations so the area of machine shop space of 3,000 sq. ft. per working pit seems unusually ample for the work contemplated, and in fact the railway officers have found that the unobstructed floor greatly facilitates the work.

shop of the Pennsylvania recently built at Logansport, Ind. The heating is with a hot blast system conducted by conduits from a central boiler plant adjoining the shop and is so arranged that recirculating air can be used if desired.

The plant has now been in operation about three months but has already proved its fitness for the work of reducing



Plan of the Cornwall Shop

The Cornwall shop contains 13,000 sq. ft. of sash area, or nearly one sq. ft. of sash to every sq. ft. of floor area. This gives practically daylight working conditions in all parts of the building.

The shop is lighted artificially by high power nitrogen lamps, following in general the layout used in the erecting

de-wheeling operations from five to six hours to less than a quarter of that time. It was designed, built and equipped by The Austin Company, Cleveland, Ohio, under the direct supervision of its Philadelphia office, and under the general supervision of John Wintersteen, master mechanic of the Cornwall Railroad.

The Interior of the Shop Is Almost as Light as Outdoors

Expenditures of the Railways for Labor and Material

Over a Billion Dollars' Worth of Material Used to Maintain and Operate Class I Roads in 1920

THE FIRST COMPLETE segregation of all expenditures for labor, fuel and other materials, irrespective of the primary accounts, has recently been prepared by the Bureau of Railway Economics from information in the files of the Interstate Commerce Commission for the fiscal years from 1912 to 1920, inclusive.

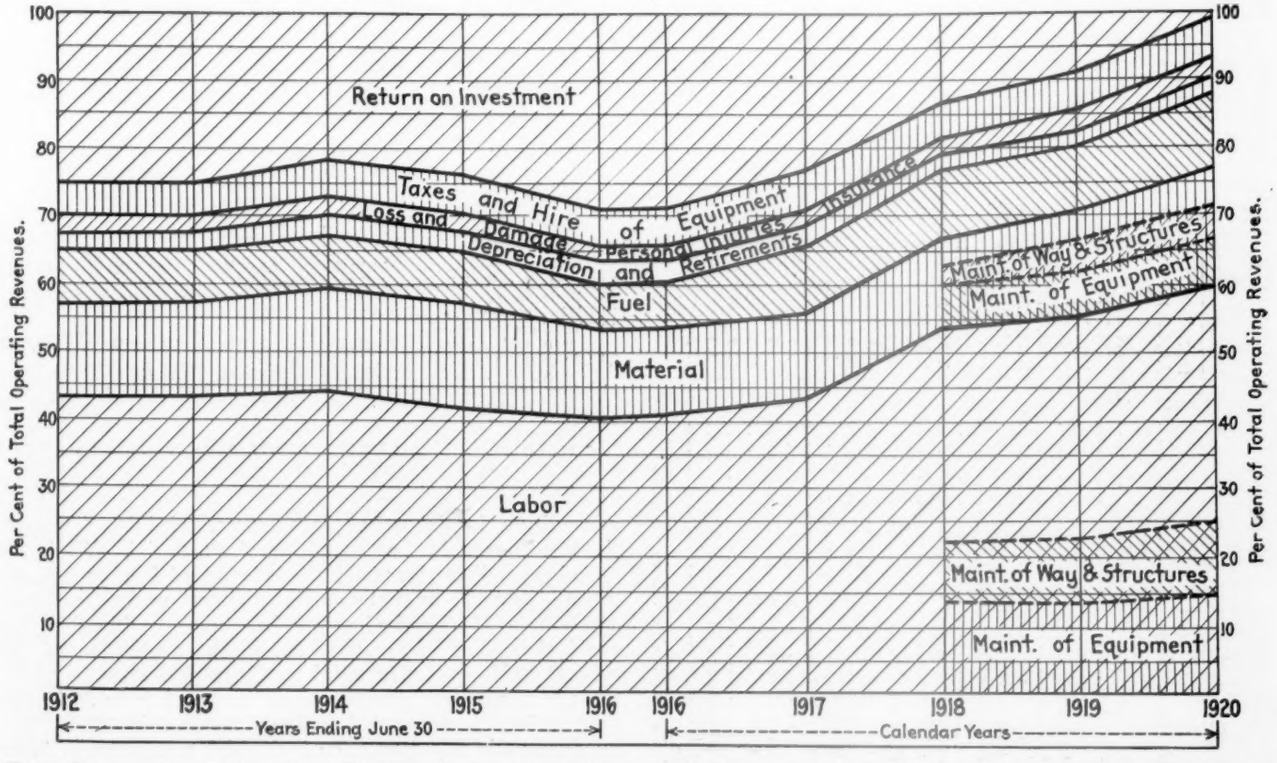
These data show that from less than $40,000,000 in 1912 and less than $500,000,000 in 1917, the expenditures of the Class I railroads of the United States for materials required for the maintenance and operation of the properties increased until they exceeded $1,000,000,000 in 1920. In addition to these expenditures, the railroads normally have spent about $500,000,000 annually at pre-war prices on additions and betterments chargeable to capital account, of which probably considerably more than half was accounted for by material purchases.

From a low point in 1915 the total expenditure for labor by the Class I railroads has increased from $1,190,000,000 to $3,698,000,000 in 1920 and the locomotive fuel bill has increased from a low point of approximately $209,000,000 in 1915 to $673,000,000 in 1920.

The total amounts of these three major classes of operating expenses of the Class I roads are given for each fiscal year during the period in Table I, which also shows the operating expenses incurred through loss and damage, injuries to persons, and insurance, as well as the deductions from net operating revenues for taxes, hire of equipment and joint facility rentals.

The table also shows the proportion of total operating revenues which went to meet each class of expenditure during each of the fiscal years in the period. This information is shown graphically in Fig. 1, which presents a striking picture of the rapid decline in the proportion of operating revenues available for interest and dividends since 1916, due largely to the correspondingly rapid increase in the proportion of revenues required to meet the payroll. From 20.8 per cent in the fiscal year ending December 31, 1916, the total cost of labor has increased until 59.9 per cent of the operation revenues were required to meet the payroll in 1920. Of only less importance than the increased payrolls are the increases in the expenditures for material and supplies and locomotive fuel. From 12.5 per cent in 1916, the expenditures for materials and supplies increased until they amounted to 17.3 per cent of the total operating revenues in 1920, while expenditures for locomotive fuel increased from 7 per cent to 10.9 per cent of the total operating revenues during the same period. The result of these large proportionate increases in the principal items of operating expense, together with a similar though relatively less important increase in loss and damage, is that the return on the investment, which was 28.9 per cent of total operating revenues in 1916 has steadily declined until but one per cent of the total operating revenue was available for interest and dividends in 1920.

While the increase in loss and damage has not played a leading part in wiping out the proportion of total operating revenues available for interest and dividends, an inspection of the table shows that there has been an exceedingly large increase in the amount paid out on this account. Rising



NOTE.—The proportion of labor and material shown for maintenance of way and structures and maintenance of equipment are approximately but not strictly correct.

Fig. 1.—Proportionate Distribution of Railway Operating Revenues

TABLE I—DISTRIBUTION OF RAILWAY OPERATING REVENUES—CLASS 1 ROADS, 1912 TO 1920

(Excludes the Returns of Switching and Terminal Companies)

Item	Fiscal year ended June 30					Calendar year ended December 31				
	1912	1913	1914	1915	1916	1916	1917	1918	1919	1920
Total operating revenues	$2,805,006,544	$3,108,361,215	$3,031,326,963	$2,871,563,047	$3,381,597,866	$3,596,865,766	$4,014,142,748	$4,880,953,480	$5,144,795,154	$6,171,493,301
Amount										
Labor	1,209,716,686	1,338,612,385	1,337,344,135	1,190,223,755	1,366,100,518	1,468,576,394	1,739,482,142	2,613,813,351	2,843,128,432	3,698,216,351
Fuel (locomotive)	224,516,528	241,598,314	235,231,481	208,968,991	226,880,054	250,544,862	393,929,538	500,225,205	474,174,792	672,891,964
Loss and damage	33,576,352	38,821,570	42,001,909	37,532,656	30,569,002	30,958,221	44,155,962	65,730,669	116,683,270	122,022,696
Injuries to persons	27,068,802	29,783,431	31,954,890	26,425,884	26,889,717	29,485,700	33,699,135	33,440,032	37,314,145	50,682,684
Insurance	7,048,666	7,164,176	7,495,097	9,773,619	10,362,180	10,731,935	13,541,612	11,518,205	410,677	15,884,079
Depreciation and retirements	71,123,327	84,783,585	91,284,870	101,036,360	117,411,680	119,785,157	115,404,686	119,233,705	126,292,105	145,252,339
Material, supplies and miscellaneous	386,045,450	432,700,102	458,111,430	447,199,349	432,679,635	447,316,143	489,112,049	638,107,030	801,712,094	1,063,769,900
Uncollectible railway revenues	.....	.....	.....	649,917	806,747	797,486	700,091	613,821	916,889	1,224,980
Taxes	109,445,407	118,386,859	135,572,579	133,276,330	145,517,034	157,113,372	213,920,095	223,175,379	232,601,396	278,868,668
Hire of equipment and joint facilities rents	27,981,943	28,900,358	31,312,425	33,371,353	39,508,340	41,471,979	36,128,668	36,527,480	56,576,401	60,751,014
Return on investment	703,484,383	787,610,435	661,018,147	683,104,833	984,872,959	1,040,084,517	934,068,770	638,568,603	454,984,953	61,928,626
Distribution Expressed in Cents per Dollar	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Labor	43.1	43.1	44.1	41.5	40.4	40.8	43.3	53.6	55.3	59.9
Fuel (locomotive)	8.0	7.8	7.8	7.3	6.7	7.0	9.8	10.2	9.2	10.9
Loss and damage	1.2	1.3	1.4	1.3	0.9	0.9	1.1	1.3	2.3	2.0
Injuries to persons	1.0	1.0	1.0	.09	0.8	0.8	0.8	0.7	0.7	0.8
Insurance	.03	0.2	0.3	0.3	0.3	0.3	0.4	.02	0.1	0.2
Depreciation and retirements	2.5	2.7	3.0	3.5	3.5	3.3	2.9	2.4	2.4	2.4
Material, supplies and miscellaneous	13.8	13.9	15.1	15.6	12.8	12.5	12.2	13.1	15.6	17.3
Taxes	3.9	3.8	4.5	4.6	4.3	4.4	5 3	4.6	4.5	4.5
Hire of equipment and joint facilities rents	1.0	0.9	1.0	1.2	1.2	1.1	0.9	0.8	1.1	1.0
Return on investment	25.2	25.3	21.8	23.8	29.1	28.9	23.3	13.1	8.8	1.6

*Includes uncollectible railway revenues.

from about $33,600,000 in 1912 to $42,000,000 in 1914, and then decreasing to less than $31,000,000 in 1916, the cost of loss and damage increased to over $122,000,000 in 1920, an amount almost four times as great as that in 1916. Proportionately this is by far the largest increase shown in any of the classes under which railway expenditures are grouped in the table.

Maintenance of Way and Structures

A similar classification of the expenditures for maintenance of way and structures and maintenance of equipment will be found in Tables II and III. In Table II it will be noted that from an average annual expenditure of over $209,900,000 for the test period, the expenditure for labor employed on maintenance of way and structures has increased to practically $577,700,000 and that whereas the cost of labor accounted for 54.71 per cent of the total charges to maintenance of way and structures during the test period, last year it amounted to 60.09 per cent.

As might be expected, this proportionate increase in the expenditure for labor has been accompanied by a proportionate decrease in the expenditure for material. While the actual expenditure for material has increased from an average of $133,500,000 annually during the test period to $285,193,000 in 1920, this increase has been considerably less rapid than that in the payroll and the proportion of the amount paid out for material to the total charges to maintenance of way and structures has decreased from 34.79 per cent during the test period to 29.67 per cent in 1920. The notable fact in this connection is the high proportion of labor and the low proportion of materials during 1918, when labor accounted for 65.07 per cent of all charges for maintenance of way and structures and material for 25.25 per cent, al-

TABLE II—COMPARISON OF SELECTED PHYSICAL UNITS APPLIED AND TOTAL CHARGES TO MAINTENANCE OF WAY AND STRUCTURES ACCOUNT

For All Class 1 Roads of the United States Answering Bureau of Railway Economics' Questionnaire, Form 1, Issued March 21, 1921 (93 per cent of Total)

	Item	Average per annum test period	Calendar year 1918	1919	1920
Ties:					
1	Switch ties, board measure—feet	172,689,571	160,024,789	176,079,389	170,345,383
2	Bridge ties, board measure—feet	55,625,964	45,400,555	49,644,851	41,533,926
3	All other ties, number	83,885,109	69,327,243	73,398,922	77,015,580
4	Total cost of ties.	58,135,355	62,886,865	84,156,035	107,772,885
Rails:					
5	Total tons new and second hand rails charged to M. of W. & S.	2,041,676	1,615,963	2,027,159	2,262,033
6	Total cost of rail.	$54,166,631	$50,836,964	$69,961,049	$82,219,999
Ballast:					
7	Total yards applied	17,065,599	14,796,252	17,518,791	19,118,553
8	Total cost	$5,506,061	$6,472,151	$9,481,545	$12,045,170
9	Average cost per yard	$0.323	$0.437	$0.541	$0.630
Total Charges to Maint. of Way and Struct.:					
10	Cost of labor	$209,906,144	$401,331,400	$439,140,739	$577,688,004
11	Cost of material	133,498,901	155,700,294	225,449,765	285,193,078
12	Retirements	16,856,749	17,358,549	26,612,381	23,617,162
13	Miscellaneous	23,437,613	42,352,374	36,502,426	74,806,548
14	Total cost M. of W. and struct.	383,699,407	616,742,617	727,705,311	961,304,792
Ratios:					
15	Cost of labor	54.71%	65.07%	60.35%	60.09%
16	Cost of material	34.79	25.25	30.98	29.67
17	Retirements	4.39	2.81	3.66	2.46
18	Miscellaneous	6.11	6.87	5.01	7.78
19	Total cost maint. of way and struct.	100.00%	100.00%	100.00%	100.00%
20	Aver. miles of road operated	216,365.42	218.396.01	218,470.67	219,565.98
21	Aver. miles of all tracks operated.	334,802.64	347,895.44	350,080.19	352,077.35
22	Total train miles (excl. work trains)	1,111,318,695	1,093,777,083	1,043,965,272	1,123,589,412

though the actual expenditures for material during this year was considerably larger than the average for the test period.

It will be noted that the expenditure for rail, ties and ballast, which amounted to $202,038,000 in 1920, was 71 per cent of the total expenditures for materials used in the maintenance of way department and that during the test period the average yearly expenditure for these materials amounted to over 77 per cent of the total material expenditures.

In this connection the fact should not be overlooked that these figures deal only with maintenance expenditures, and that normally the amount spent on additions and betterments to permanent way and structures, chargeable to capital account, is equal to if not greater than the expenditures chargeable to operating expenses. Approximately the same division between labor and material as exists in the case of the maintenance accounts also applies in the case of the capital expenditures; hence it is evident that the amount of materials shown in Table II represents only about one-half of the average annual purchases for use in track and other permanent railway structures.

Maintenance of Equipment

The outstanding feature of Table III is the large increase in the total expenditures for maintenance of equipment during 1918, 1919 and 1920 as compared with the average annual expenditure during the text period. From an average of creased to over $1,000,000,000 in 1918. In 1919 there was a further increase to $1,145,000,000, or about 11 per cent over $530,370,000 during the test period these expenditures increased to over $1,000,000,000 in 1918. In 1919 there was a further increase to $1,145,000,000, or about 11 per cent over 1918, while in 1920 the total cost of equipment maintenance amounted to $1,487,000,000 or practically 30 per cent more than in the preceding year.

A similar comparison of the cost of maintaining locomotives, freight cars and passenger cars, each considered separately, shows that the total increase in the expenditure for locomotive maintenance has been proportionately considerably greater than that for either freight or passenger cars and that the increase in the expenditure for the maintenance of freight cars has been proportionately much greater than that for pas-

TABLE III—COMPARISON OF COST OF REPAIRS TO LOCOMOTIVES, FREIGHT CARS, PASSENGER CARS AND TOTAL MAINTENANCE OF EQUIPMENT CHARGES, DIVIDED BETWEEN LABOR, MATERIAL, DEPRECIATION, RETIREMENTS AND MISCELLANEOUS

For All Class 1 Roads of United States Answering Bureau of Railway Economics' Questionnaire, Form 2, Issued March 21, 1921—(93 Per Cent of Total)

	Item	Average per annum test period	Calendar year 1918	1919	1920	Ratios—Per cent: Average per annum test period	1918	1919	1920
Cost of Maintenance:									
Locomotives									
1	Repairs, labor	$115,711,712	$298,395,776	$299,580,321	$395,786,062	57.05	67.86	63.53	64.95
2	Repairs, material	56,352,053	100,076,355	120,948,457	150,396,981	27.78	22.76	25.65	24.68
3	Depreciation	22,704,837	27,359,869	32,969,154	35,648,556	11.19	6.22	6.99	5.85
4	Retirements	3,629,190	Cr. 127,204	1,417,713	485,789	1.80	Cr. 0.03	0.30	0.08
5	Miscellaneous	4,439,995	13,992,111	16,644,139	27,043,328	2.18	3.19	3.53	4.44
6	Total maintenance, locomotives	202,837,787	439,696,907	471,559,784	609,360,716	100.00	100.00	100.00	100.00
Freight Cars									
7	Repairs, labor	92,837,992	231,074,835	249,701,127	316,591,538	40.25	54.73	51.87	50.51
8	Repairs, Material	70,818,665	120,927,034	147,903,625	185,084,225	30.71	28.64	30.73	29.53
9	Depreciation	49,303,553	58,497,974	64,251,657	74,033,791	21.38	13.86	13.35	11.82
10	Retirements	11,613,589	5,837,164	4,268,467	1,159,116	5.04	1.38	0.89	0.18
11	Miscellaneous	6,060,542	5,849,693	15,253,192	49,877,966	2.62	1.39	3.16	7.96
12	Total maintenance, freight cars	230,634,341	422,186,700	481,378,068	626,746,636	100.00	100.00	100.00	100.00
Passenger Cars									
13	Repairs, labor	21,123,286	39,068,922	46,595,714	57,908,224	44.99	55.11	53.78	54.39
14	Repairs, material	13,121,344	17,633,461	23,844,566	29,318,936	27.95	24.88	27.52	27.54
15	Depreciation	9,192,990	9,690,125	10,553,430	10,753,718	19.58	13.67	12.18	10.10
16	Retirements	1,073,255	521,699	166,877	597,083	2.29	0.74	0.19	0.56
17	Miscellaneous	2,439,451	3,970,247	5,476,752	7,884,667	5.19	5.60	6.33	7.41
18	Total maintenance, passenger cars	46,950,326	70,884,454	86,637,739	106,462,628	100.00	100.00	100.00	100.00
Maintenance of Equipment									
19	Labor	252,781,140	621,002,474	651,439,800	850,055,733	47.66	60.29	56.90	57.16
20	Material	150,680,017	258,071,229	314,274,345	391,924,437	28.41	25.05	27.45	26.35
21	Depreciation	84,940,739	100,747,158	112,728,081	124,039,059	16.02	9.78	9.85	8.34
22	Retirements	17,888,435	6,629,697	6,675,434	4,858,588	3.37	0.64	0.58	0.33
23	Miscellaneous	24,078,621	43,647,286	59,753,922	116,251,864	4.54	4.24	5.22	7.82
24	Total maintenance of equipment	530,368,952	1,030,097,844	1,144,872,082	1,487,129,681	100.00	100.00	100.00	100.00
Operating Statistics:									
41	No. of locomotives owned or leased	58,059	59,414	60,500	61,129	.....	.....	.....	.....
42	No. of freight cars owned or leased	2,140,373	2,202,921	2,209,093	2,219,673	.....	.....	.....	.....
43	No. of passenger cars owned or leased	49,526	50,952	50,715	50,750	.....	.....	.....	.....
44	Locomotive-miles (incl. switching)	1,561,027,831	1,602,602,416	1,482,439,956	1,623,600,543	.....	.....	.....	.....
45	Freight car-miles (incl. caboose)	20,763,335,304	21,372,205,721	20,115,471,903	21,725,229,623	.....	.....	.....	.....
46	Passenger car-miles	3,156,414,488	3,032,100,087	3,246,067,026	3,414,352,123	.....	.....	.....	.....

TABLE IV—PROPORTIONATE EXPENDITURES FOR LABOR AND MATERIALS ON MAINTENANCE OF EQUIPMENT

	Average per annum, test period	1918	1919	1920
Locomotives				
Labor	67.2	74.9	71.2	72.5
Material	32.8	25.1	28.8	27.5
Freight Cars				
Labor	56.7	65.6	62.8	63.1
Material	43.3	34.4	37.2	36.9
Passenger Cars				
Labor	61.6	68.8	66.2	66.4
Material	38.4	31.2	33.8	33.6
All Equipment				
Labor	62.7	70.6	67.4	68.4
Material	37.3	29.4	32.6	31.6

TABLE V—AVERAGE UNIT COST OF EQUIPMENT MAINTENANCE

	Average per annum, test period		1918		1919		1920	
	Per loco.	Per loco. mile	Per loco.	Per loco. mile	Per loco.	Per loco. mile	Per loco.	Per loco. mile
Locomotives								
Labor and material	$2,964	$0.101	$6,707	$0.249	$6,951	$0.284	$8,935	$0.336
Total	3,494	.129	7,401	.274	7,794	.318	9,968	.375
	Per frt. car	Per car mile	Per frt. car	Per car mile	Per frt. car	Per car mile	Per frt. car	Per car mile
Freight Cars								
Labor and material	$76.50	$0.008	$159.80	$0.016	$180.00	$0.020	$226.00	$0.023
Total	$107.80	.011	191.70	.020	217.90	.024	282.40	.029
	Per pass. car	Per car mile	Per pass. car	Per car mile	Per pass. car	Per car mile	Per pass. car	Per car mile
Passenger Cars								
Labor and material	$691	$0.011	$1,113	$0.019	$1,389	$0.022	$1,719	$0.026
Total	948	.015	1,391	.023	1,708	.027	2,098	.031

senger cars. Comparing these expenditures in 1920 with the average during the test period, the increase in locomotive maintenance has been 200 per cent while the increases in freight and passenger car maintenance have been 172 per cent and 127 per cent, respectively.

Table III also shows the ratios of the expenditures for labor, material, depreciation, retirements and miscellaneous expenditures, to the total maintenance expenditures for locomotives, freight cars and passenger cars and for all classes of equipment combined. A study of these ratios discloses the fact that in 1918 there was a large proportionate increase in the amount paid out for labor by the mechanical department, which was accompanied by a considerable reduction in the proportionate expenditure for material. It will be seen that the proportion of labor to total expenditures still remains considerably higher than during the test period, while the proportion of material is still low.

A clearer conception of the changes in the relationship of these two great classes of direct expenditures may be obtained by considering them separately from the other items, which have little direct relation to the actual condition of the equipment in service. These relationships for each class of equipment and for the department as a whole are shown in Table IV.

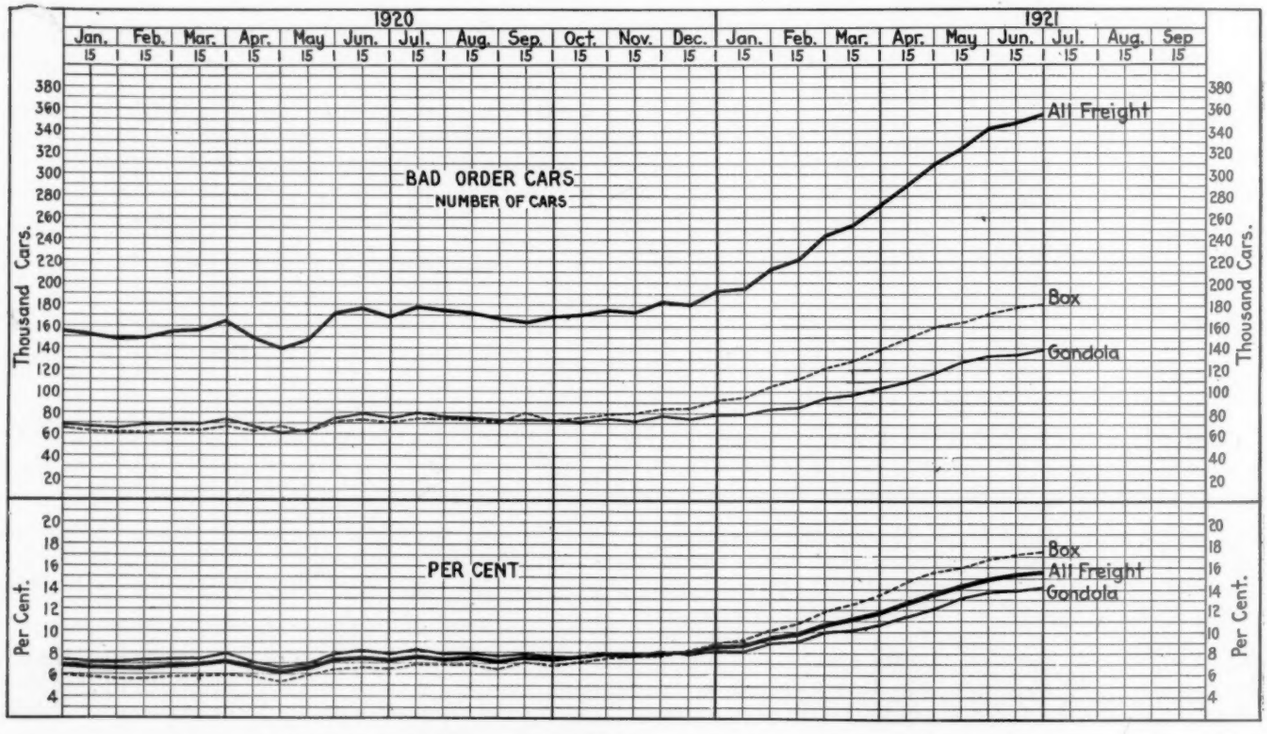
The direct and total annual expenditures per unit of equipment and per locomotive and car mile are shown in Table V. The direct cost of maintenance (labor and material) has increased from an average of $2,964 per locomotive per year during the test period to $8,935 per locomotive in 1920, while the total cost of maintenance increased from an average of $3,494 per locomotive per year during the test period to $9,968 in 1920. For the same period the direct cost of maintenance per locomotive mile has increased from 10.1 cents to 33.6 cents and the total cost from 12.9 cents to 37.5 cents. Freight car maintenance has increased from an average of $76.50 per car per year to $226.00 for labor and material and from $107.80 total charges to $282.40, while the average expenditure per passenger car has increased from $691 for material and labor to $1,719 and from $948 total charge to $2,098 during the same period.

Bad Order Cars

Considerable space has been given in the columns of the *Railway Age* recently to the bad order car situation. The figures which follow give the details as to bad order box, gondola and all cars from January 1 to July 1, the latest figure reported. On the chart the number and per cent of bad order cars are plotted from January 1, 1920, to date.

BAD ORDER CARS

Date	Box Cars: Bad Order	Box Cars: Per Cent	Gondola Cars: Bad Order	Gondola Cars: Per Cent	All Cars: Total On Line	All Cars: Bad Order	All Cars: Per Cent
January 1	91,450	8.9	78,273	8.3	2,251,173	191,234	8.5
January 15	94,325	9.2	78,635	8.3	2,252,432	194,113	8.6
February 1	105,056	10.1	84,065	8.9	2,265,502	213,180	9.4
February 15	111,134	10.7	85,694	9.0	2,267,238	220,420	9.7
March 1	122,595	11.9	94,863	9.9	2,273,033	243,586	10.7
March 15	128,183	12.5	97,514	10.1	2,268,585	252,824	11.1
April 1	138,218	13.4	103,176	10.7	2,281,986	270,319	11.8
April 15	149,810	14.6	109,391	11.4	2,275,484	289,271	12.7
May 1	159,856	15.5	117,791	12.1	2,289,282	309,971	13.5
May 15	164,429	15.9	127,046	13.1	2,288,242	324,969	14.2
June 1	172,593	16.7	133,500	13.6	2,301,749	341,337	14.8
June 15	177,123	17.1	134,637	13.7	2,302,724	346,861	15.1
July 1	180,544	17.4	138,144	14.1	2,300,155	354,611	15.4



Bad Order Cars as Reported Semi-Monthly, January 1, 1920 to July 1, 1921

Operating Revenue and How It Was Expended

A Review in Colored Charts of the Figures and Changed Conditions from 1912 to 1920

IN 1912, of each dollar of operating revenue of the Class I railroads, those earning over $1,000,000 gross annually, 43.1 cents went to labor; 8 cents for fuel; 13.8 cents for material, supplies, etc., and 25.2 cents for return on the investment. In 1920, under the new order of things, labor received 59.9 cents of each dollar of operating revenue; there was 10.9 cents spent for fuel; 17.3 cents for materials, supplies, etc., and but one cent for return on investment. The gross revenues in 1912 were $2,805,006,544; in 1920, $6,171,493,301. The payments to labor in 1912 were $1,209,716,686; in 1920, $3,698,216,351. On the other hand the return on investment which in 1912 was $708,484,383; in 1920 was but $61,928,626. Interest charges in 1920 approximated $450,000,000, to which must also be added a sum, not yet determined, representing dividend payments. The difference between the return on the investment, as previously noted, $61,928,626, and the amount paid in interest and dividends, represents what the government had to make up in the form of standard return or guaranty or else was paid from surplus earned by the railroads in former years.

Shown in Colored Charts

These facts and considerable additional data of like importance are presented on the two following pages in the form of colored charts which have been reproduced from similar charts issued by the Bureau of Railway Economics. The difficulty of analyzing the railway situation and in arriving at proper conclusions in the matter lies in no small measure in the inability to visualize the many imposing figures which have been compiled and presented. It is sufficiently difficult to visualize the relationships as between the various classes of expenditures in a single year; it is still more difficult to see the relationships as between a series of years. These charts will assist in permitting that visualization not only for 1920 but for the period from 1912 to 1920.

Railway Operating Revenue and How It Was Expended

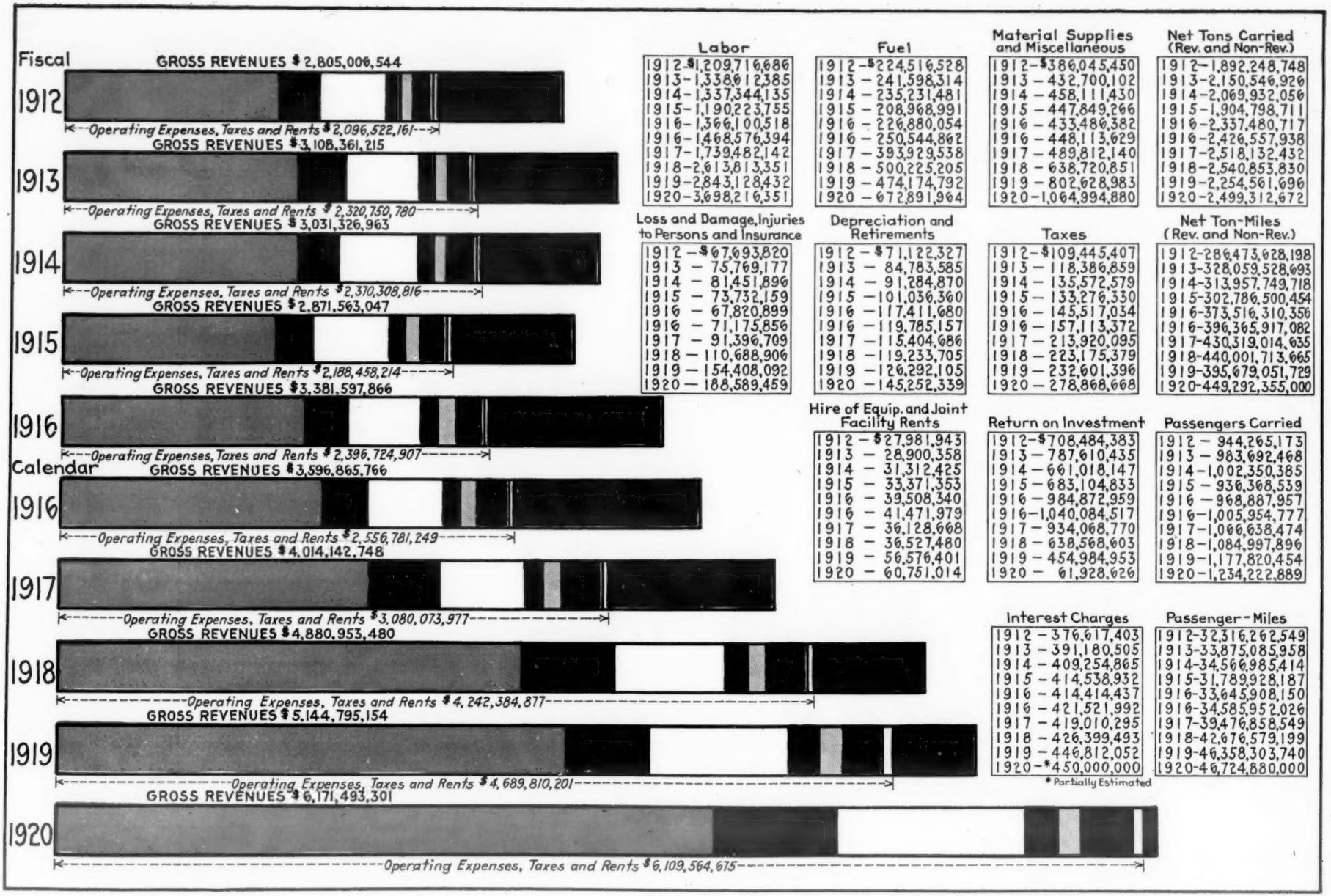
There are two charts given. One is entitled, Railway Operating Revenue and How It Was Expended, 1912-1920. This chart shows in dollars the gross revenues for each year; the operating expenses, taxes and rents; and the amounts spent respectively for: Labor; fuel; materials, supplies, etc.; loss and damage, injuries to persons and insurance; depreciation and retirements; taxes; hire of equipment and joint facility rents, and finally the diminishing figure representing return on investment.

Distribution of Each Dollar of Railway Operating Revenues

The other chart shows the same relationships in terms of the distribution of the dollar. It is entitled, Distribution of Each Dollar of Railway Operating Revenues, 1912-1920.

To assist the reader to follow the situation as between the several years there are also shown the actual figures covering each class of expenditures in addition to which the essential traffic statistics are shown, such as: Net tons carried; net ton miles; passengers carried and passenger miles.

These charts should be of great assistance to all those interested in the welfare of the American railroads, not only because of the figures which they give in convenient and readily available form, but because of the striking manner in which the data is used to point out the essential facts of the situation.



Labor

1912	$1,209,716,686
1913	1,338,612,385
1914	1,337,344,135
1915	1,190,223,755
1916	1,366,100,518
1916	1,468,576,394
1917	1,739,482,142
1918	2,613,813,351
1919	2,843,128,432
1920	3,698,216,351

Fuel

1912	$224,516,528
1913	241,598,314
1914	235,231,481
1915	208,968,991
1916	226,880,054
1916	250,544,862
1917	393,929,538
1918	500,225,205
1919	474,174,792
1920	672,891,964

Material Supplies and Miscellaneous

1912	$386,045,450
1913	432,700,102
1914	458,111,430
1915	447,849,266
1916	433,486,382
1916	448,113,629
1917	489,812,140
1918	638,720,851
1919	802,628,983
1920	1,064,994,880

Net Tons Carried (Rev. and Non-Rev.)

1912	1,892,248,748
1913	2,150,546,926
1914	2,069,932,056
1915	1,904,798,711
1916	2,337,480,717
1916	2,426,557,938
1917	2,518,132,432
1918	2,540,853,830
1919	2,254,561,696
1920	2,499,312,672

Loss and Damage, Injuries to Persons and Insurance

1912	$67,693,820
1913	75,769,177
1914	81,451,896
1915	73,732,159
1916	67,820,899
1916	71,175,856
1917	91,396,709
1918	110,688,906
1919	154,408,092
1920	188,589,459

Depreciation and Retirements

1912	$71,122,327
1913	84,783,585
1914	91,284,870
1915	101,036,360
1916	117,411,680
1916	119,785,157
1917	115,404,686
1918	119,233,705
1919	126,292,105
1920	145,252,339

Taxes

1912	$109,445,407
1913	118,386,859
1914	135,572,579
1915	133,276,330
1916	145,517,034
1916	157,113,372
1917	213,920,095
1918	223,175,379
1919	232,601,396
1920	278,868,668

Net Ton-Miles (Rev. and Non-Rev.)

1912	286,473,628,198
1913	328,059,528,693
1914	313,957,749,718
1915	302,786,500,454
1916	373,516,310,356
1916	396,365,917,082
1917	430,319,014,635
1918	440,001,713,665
1919	395,679,051,729
1920	449,292,355,000

Hire of Equip. and Joint Facility Rents

1912	$27,981,943
1913	28,900,358
1914	31,312,425
1915	33,371,353
1916	39,508,340
1916	41,471,979
1917	36,128,668
1918	36,527,480
1919	56,576,401
1920	60,751,014

Return on Investment

1912	$708,484,383
1913	787,610,435
1914	661,018,147
1915	683,104,833
1916	984,872,959
1916	1,040,084,517
1917	934,068,770
1918	638,568,603
1919	454,984,953
1920	61,928,626

Passengers Carried

1912	944,265,173
1913	983,692,468
1914	1,002,350,385
1915	936,368,539
1916	968,887,957
1916	1,005,954,777
1917	1,066,638,474
1918	1,084,997,896
1919	1,177,820,454
1920	1,234,222,889

Interest Charges

1912	376,617,403
1913	391,180,505
1914	409,254,865
1915	414,538,932
1916	414,414,437
1916	421,521,992
1917	419,010,295
1918	426,399,493
1919	446,812,052
1920	*450,000,000

* Partially Estimated

Passenger-Miles

1912	32,316,262,549
1913	33,875,085,958
1914	34,566,985,414
1915	31,789,928,187
1916	33,645,908,150
1916	34,585,952,026
1917	39,476,858,549
1918	42,676,579,199
1919	46,358,303,740
1920	46,724,880,000

Chart and Figures from Bureau of Railway Economics

Railway Operating Revenue and How It Was Expended. Class I Railroads, 1912-1920

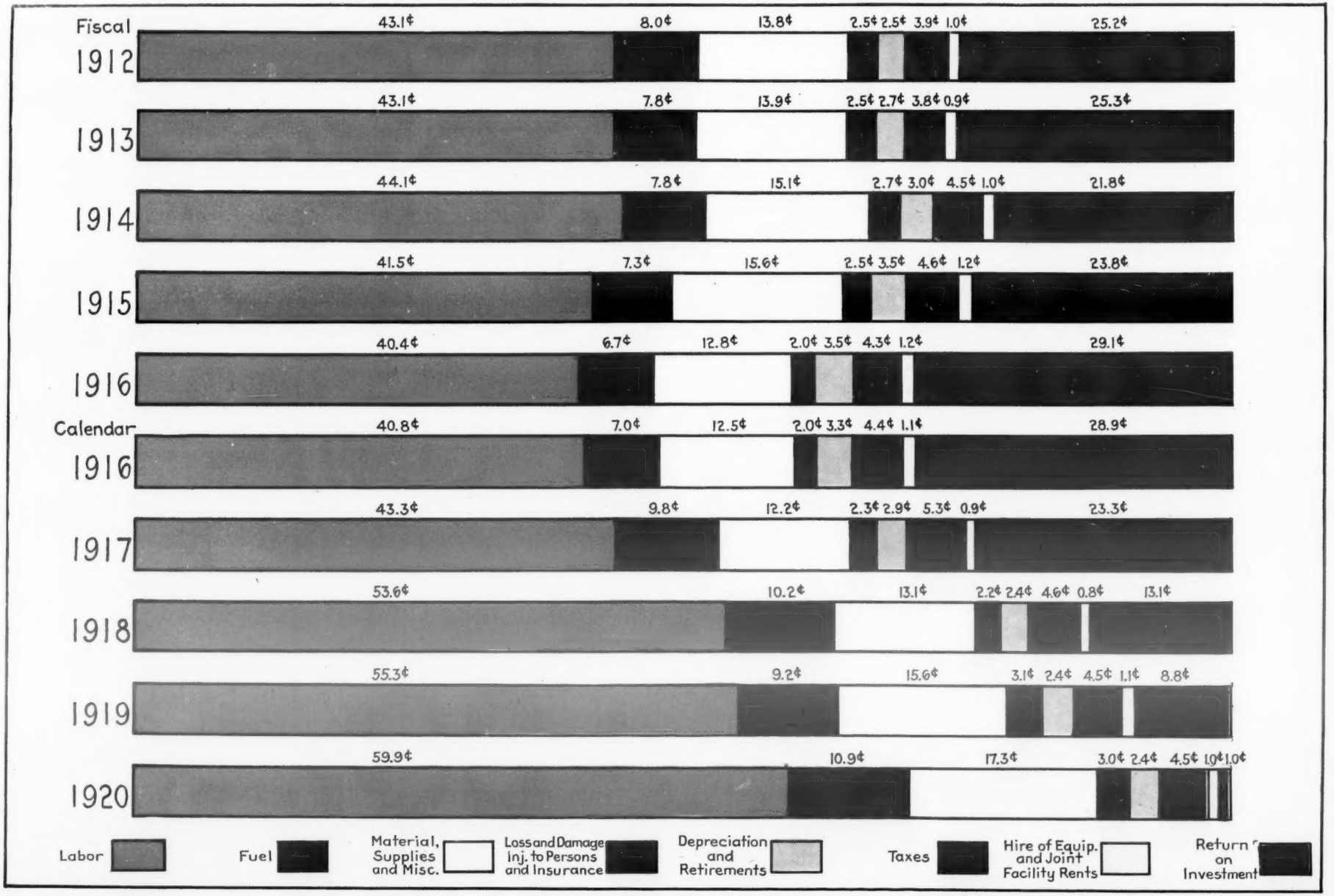


Chart and Figures from Bureau of Railway Economics

Distribution of Each Dollar of Railway Operating Revenue. Class I Railroads, 1912-1920

Revenue Car Loading

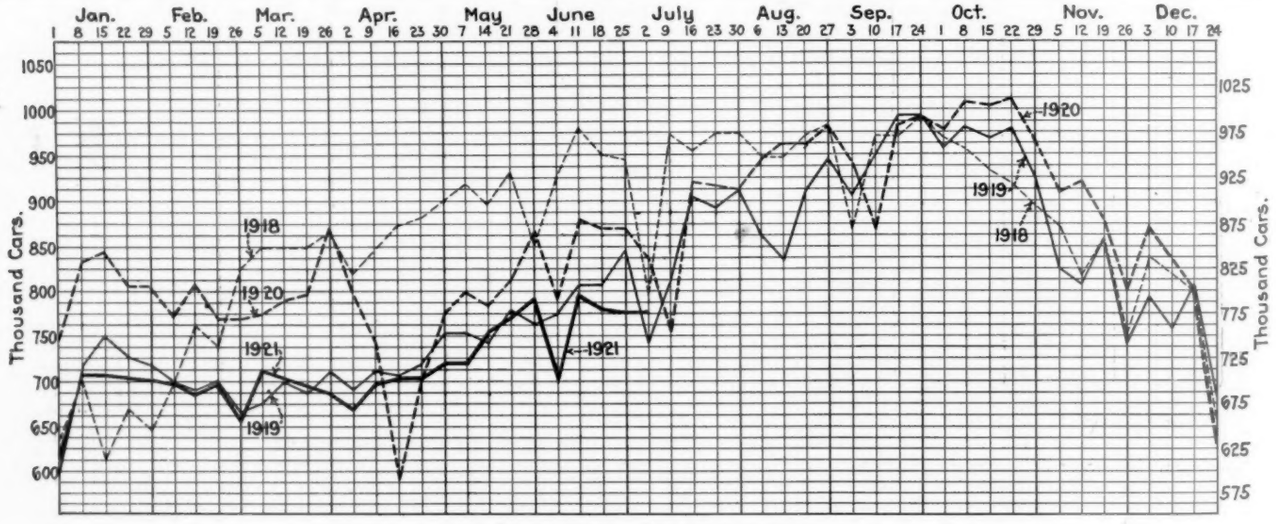
The business world is beginning to realize in greater degree the duties which the railways perform in assisting the industry of the country. The result has been an entirely new interest in the figures of railway operation and a closer observation of transportation conditions. This is shown by the manner in which such figures as those relating to revenue, car loading, car surpluses and shortages, bad order cars, etc., are being watched in business circles.

Outside of the figures of railway earnings and expenses, there is probably no information relative to railway operation which is being watched at present with greater interest than that of revenue car loading.

The following table is a compilation of the weekly car loading reports covering a period of three years and to assist in making the data of greater use, a chart is given. It will be noted that for the years 1919 and 1920 there are two columns, one headed "As originally reported" and one "As revised." The revised figures are those issued with the 1921 figures for purposes of comparison. The figures "as originally reported" cover the week ending Saturday. The revised figures cover the week ending not necessarily Saturday but instead on the same date. Thus the figure of 774,808 for July 2, 1921, when issued a week or so ago was compared not with the figure originally issued last year, 839,629, representing the loadings for the week ending Saturday, July 3, 1920, but with a revised figure of 891,621, representing the loading for the week ending July 2, 1920. In addition the revised figures also include some corrections of the previously reported figures.

REVENUE CAR LOADING

Week ending	1921	1920 As originally reported	1920 As revised	1919 As originally reported	1919 As revised	1918 As originally reported
January 1	598,905	744,969	745,446	612,741	612,741	641,057
8	706,413	860,227	830,673	723,801	723,801	696,907
15	709,888	865,992	840,524	758,609	758,609	612,576
22	703,115	821,738	804,866	734,293	734,293	668,941
29	699,936	816,967	803,332	726,555	718,297	642,016
February 5	696,977	780,455	762,680	699,659	692,614	686,621
12	681,627	802,322	786,633	700,163	689,128	763,394
19	695,506	868,673	772,102	785,742	700,913	737,442
26	658,222	765,239	783,295	665,478	666,708	824,729
March 5	712,822	774,297	811,106	676,964	675,276	850,690
12	702,068	806,839	819,329	675,933	701,266	850,701
19	691,707	796,566	855,060	684,264	699,920	850,417
26	687,852	866,709	900,386	709,471	713,275	862,883
April 2	666,642	801,588	858,827	688,279	701,559	815,138
7	693,719	748,898	801,559	710,033	711,282	838,184
16	703,896	584,089	601,695	702,894	706,012	873,395
23	704,527	691,980	717,772	713,599	715,042	880,102
30	721,997	772,908	800,960	747,004	752,362	898,927
May 7	718,025	799,711	843,184	753,287	.....	918,350
14	750,158	784,044	843,145	739,945	.....	893,724
21	768,330	809,431	862,074	777,324	777,324	929,106
28	787,237	861,316	898,207	763,761	763,761	845,860
June 4	706,508	768,974	828,907	876,354	776,610	918,911
11	788,907	878,041	930,976	863,068	807,205	974,840
18	780,741	869,142	916,736	850,226	807,907	952,905
25	775,051	869,350	911,503	867,124	845,684	947,841
July 2	774,808	839,629	891,621	743,226	743,226	793,621
9	639,698	757,666	796,191	809,845	809,845	975,621
16	776,252	923,968	.....	902,296	.....	953,320
23	.....	915,792	.....	909,682	.....	976,554
30	.....	914,128	.....	914,297	.....	974,922
August 7	.....	942,150	.....	872,073	.....	947,955
14	.....	962,352	.....	832,439	.....	948,788
21	.....	964,256	.....	913,209	.....	971,622
28	.....	985,064	.....	951,653	.....	980,531
September 4	.....	947,743	.....	904,393	.....	872,560
11	.....	872,043	.....	946,970	.....	974,269
18	.....	983,913	.....	994,991	.....	970,458
25	.....	994,687	.....	995,901	.....	991,980
October 2	.....	975,946	.....	957,596	.....	971,895
9	.....	1,009,787	.....	982,171	.....	959,722
16	.....	1,005,563	.....	972,078	.....	927,134
23	.....	1,010,961	.....	977,051	.....	920,111
30	.....	973,120	.....	935,479	.....	892,392
November 6	.....	910,592	.....	826,724	.....	873,854
13	.....	919,909	.....	808,304	.....	810,430
20	.....	880,528	.....	854,601	.....	857,377
27	.....	797,673	.....	793,197	.....	735,628
December 4	.....	872,162	.....	789,286	.....	837,806
11	.....	834,897	.....	761,940	.....	820,202
18	.....	796,858	.....	806,734	.....	796,116
25	.....	639,275	.....	684,784	.....	549,975



Revenue Car Loading, 1918 to 1921

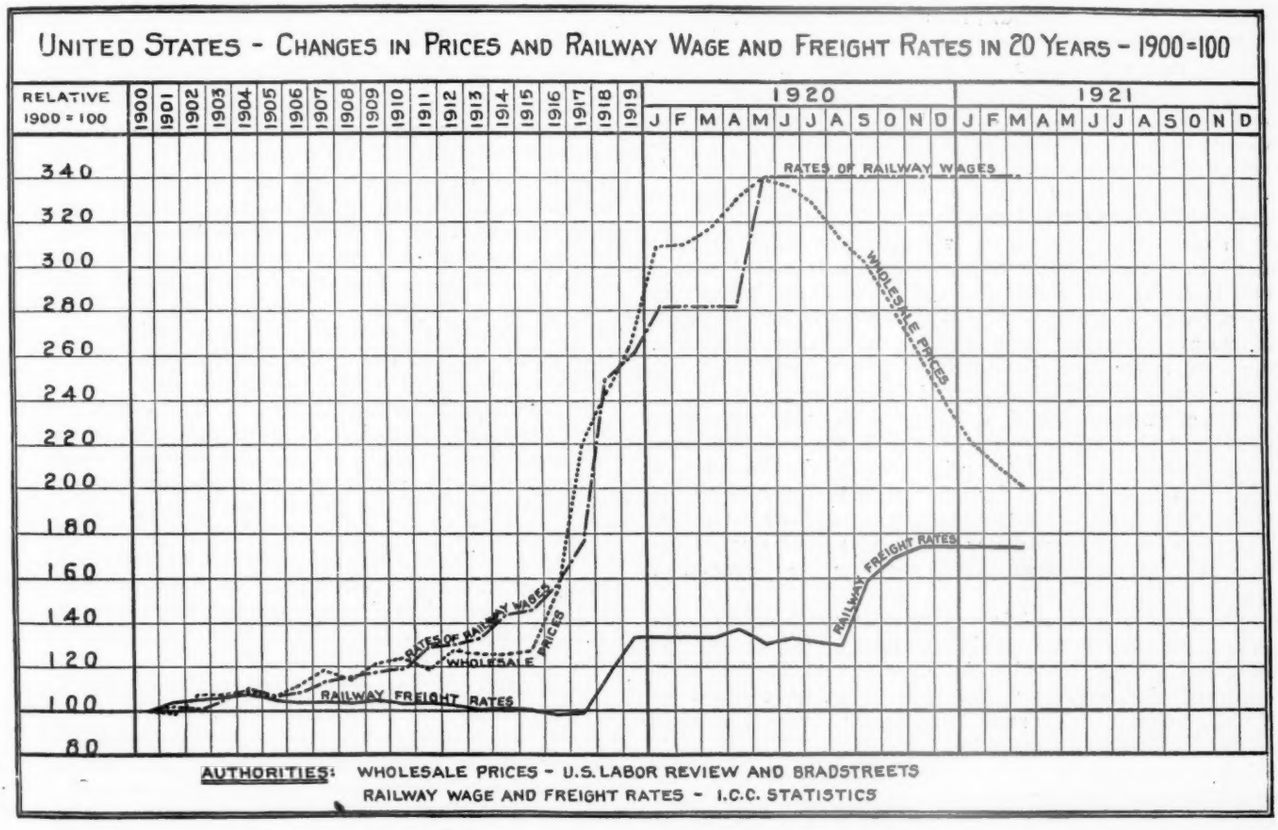
A Striking Diagram for Railroad Stockholders

Statement Prepared for Southern Pacific Shareholders— Fallacious Views About Freight Rates

By Julius Kruttschnitt
Chairman of the Executive Committee, Southern Pacific Company

THE EXECUTIVE COMMITTEE of the board of directors submits this brief of important facts developed in the inquiry conducted by the Senate Committee of Interstate Commerce, and requests your careful attention. *The main trouble with the railroads is that their revenues have not kept up with their expenses.*

About 1905 wholesale prices of commodities and the rates of railway wages began climbing. A summit never before dreamed of was reached in May, 1920. In the same year, 1905, railway freight rates began falling, and, continuing uninterruptedly, reached the lowest level in seventeen years in 1916 and 1917.


UNITED STATES - CHANGES IN PRICES AND RAILWAY WAGE AND FREIGHT RATES IN 20 YEARS - 1900=100
RELATIVE 1900 = 100
1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919
1920 J F M A M J J A S O N D
1921 J F M A M J J A S O N D
340 320 300 280 260 240 220 200 180 160 140 120 100 80
RATES OF RAILWAY WAGES
WHOLESALE PRICES
RAILWAY FREIGHT RATES
RATES OF RAILWAY WAGES
WHOLESALE PRICES
RAILWAY FREIGHT RATES
AUTHORITIES: WHOLESALE PRICES - U.S. LABOR REVIEW AND BRADSTREETS
RAILWAY WAGE AND FREIGHT RATES - I.C.C. STATISTICS

Decisions rendered in 1914, 1915 and 1917, in three appeals to Interstate Commerce Commission for better rates, afforded but slight relief, so that at the beginning of Federal control in 1918 freight rates were slightly less than in 1900; while wholesale prices were 120 per cent higher than those in 1900.

The Federal Railroad Administration made a substantial rate increase in June, 1918, which, however, fell far short of establishing any proper relation between freight rates and costs of commodities; and notwithstanding the continued and rapid rise of prices and insistent demands of labor for higher pay the Railroad Administration refused to act either as to rates or wages, and *forced the solution of these difficult problems on the owners after the return of their properties on March* 1, 1920.

Wages Increased Much More Than Freight Rates

The Federal Labor Board, by a decision made effective in May, 1920, increased wages an average of 21 per cent, raising them to a level 240 per cent above those of 1900; wholesale prices were also 240 per cent higher than in 1900, while freight rates were but 30 per cent higher.

The rate increase finally authorized by the Interstate Commerce Commission about the first of September, 1920, raised freight rates to a level only 59 per cent higher than in 1900; wholesale prices then had fallen, but were still 203 per cent higher than in 1900, while railway wages remained 240 per cent higher.

All industries except railroads (which under strict regulation were restrained from doing so), raised prices currently as costs went up, so that when at last the 1920 rate increase was granted, further increased expenses and the cost of disorganization under Federal control *more than wiped out the amount of the increase.*

Publication by the Interstate Commerce Commission in February, 1921, of revenues, expenses and net railway operating income of large (or Class I) roads for the years 1920 and 1919, coming as it did at a time of great industrial dis-

turbance and readjustment, when prices were falling and the purchasing power or the purchasing inclination of the consuming public was substantially reduced, caused great anxiety, and a thorough study of the situation was instituted to determine what bearing, if any, the present level of transportation charges has upon the existing business depression.

These data showed:

Operating revenues were for—	
1920	$6,225,402,762
1919	5,184,064,221
Increase 1920 over 1919	$1,041,338,541
Railway Operating Expenses, Taxes and Rents—	
1920	$6,163,138,341
1919	4,667,774,131
Increase 1920 over 1919	$1,495,364,210
Net Railway Operating Income was in—	
1920	$ 62,264,421
1919	516,290,090
Decrease 1920 from 1919	*$454,025,669*
And this notwithstanding the gross revenues were *larger* in 1920 than in 1919.	$1,041,338,541

Costs Over Which Railroads Had No Control

To properly allocate responsibility for this difference, which was caused by the disproportion of operating expenses, it must be understood that except as either year is affected by bad management, the operating revenues and more than 64 per cent of the operating expenses—being labor costs—and in 1920, in addition, a very substantial part of the cost of materials and supplies which were purchased by the Federal Railroad Administration, but used by the railroads at the prices paid, or contracted by the Government to be paid—*are fixed by the Government.*

In other words, that the Government prescribed the rates from which the operating revenues of the carriers are derived and likewise fixed the wages, which constituted more than 64 per cent of the operating expenses; and that the prices of the materials and supplies which the carriers must have, are fixed either by Government, as above stated, or by economic forces beyond the control of the carriers.

Out of every dollar of operating expenses 64 cents were paid for labor at prices fixed by the Government, 15 cents for materials and supplies at prices fixed by the Government, and 3½ cents were paid for other expenses incurred by the Government in the first two months of 1920, or a total of 82½ cents out of every dollar of expenses for the year 1920 was paid out at prices directly fixed by the Government itself.

The remaining materials and supplies used during 1920 were purchased by the carriers at prices fixed by general market conditions beyond their power to control, costing 15 cents out of every dollar. In other words, prices *fixed by the Government* or by market conditions cover 97½ cents out of every dollar of operating expenses.

The labor costs to the carriers of Class I were 115 per cent higher in 1920 than in 1917, and if the increased wage scale had been in effect during twelve instead of eight months in 1920 the increase would have been about 128 per cent. During the same period the gross revenues of the carriers (fixed by Government) increased less than 54 per cent.

Since the Government under the Adamson law in 1916 took charge of labor costs, these have increased from $1,468,576,000 to $3,698,216,000, the total amount paid to labor during 1920 being very *nearly sixty times the* $62,264,000 *of income yielded by the railroads to their owners* for the purpose of meeting fixed charges and dividends.

The Record of Railroad Efficiency in 1921

As to efficiency, the best evidence is that in 1920 the railroads performed the greatest transportation task in their history. They moved more freight and passengers, loaded their cars more heavily and moved them farther per day. That it cost too much to do this was due, as shown beyond all doubt, almost entirely to causes beyond the railroad managers' control.

A widespread propaganda is being carried on in favor of a general reduction of freight rates; whereas the fact is that even since the rates have been advanced the cost of transporting a great many commodities which it is asserted cannot move at the increased rates *is far less than the toll taken by commission merchants and retailers for buying and selling them.* People are misled into believing that high rates have stopped the movement of a large amount of freight, and that the railways would make more money if they would reduce rates and thereby revive traffic.

There is the strongest reason to believe that the great stagnation in business is due almost entirely to world-wide conditions which must inevitably have come if there had been no advance in freight rates.

With the decline in ocean freight rates some commodities can reach the markets of Europe for a less transportation charge—water and rail combined—than before rail rates were raised in September, 1920. Moreover, attention might well be called to the fact that the volume of freight traffic increased substantially for some time after the increased rates became effective (August 26).

The Demand for a Reduction of Freight Rates

We have shown that the policy of the Government for many years was not to raise rates in normal or good times sufficiently to yield adequate revenues, and if rates are now to be lowered on account of bad times, where will this leave the railroads? As seen on the diagram, other industries in good times, as shown by the rise in wholesale prices, reaped large profits out of which surpluses could be accumulated for use in bad times; it is shown just as clearly how the railroads were denied the enjoyment of this right; yet there is a country-wide demand before they have enjoyed the too long delayed relief contemplated by the Transportation Act, 1920, that there should be a general reduction of rates. . . .

The Transportation Act imposes on the Interstate Commerce Commission the duty of providing revenues and on the Federal Labor Board the duty of fixing wages, which is by far the largest single item of operating expenses. If wages are reduced to the general level of peace-time wages in other pursuits, such reduction, in connection with the constantly increasing efficiency of operation, to which we have already called attention, should control one factor determining net income; while the operations of the Transportation Act, if allowed to function without interference, will control the other.

Irresponsible statements as to fabulous sums that can be saved by common use of train and terminal facilities, unification of management and by the expenditure of still more fabulous sums in capital—that could not be obtained at all—to make wholesale improvements, must not be accepted without most careful investigation.

It must be remembered that during two years, 1918-1919, the Federal Railroad Administration, with autocratic control of revenues, expenses and character of service, accomplished little in these directions, although the public, from patriotic motives, cheerfully submitted to many inconveniences and inferior service. Economies in the indicated directions have long been the subject of study by the carriers; some of them have for many years been in use by all of the roads, and all of them by some of the roads.

Railroad executives have established agencies to give all questions of economic and efficient management thorough study by the highest talent obtainable, and they may be trusted in every respect to furnish the "honest, efficient and economic management" required by the Transportation Act, 1920.

Car Surpluses and Shortages

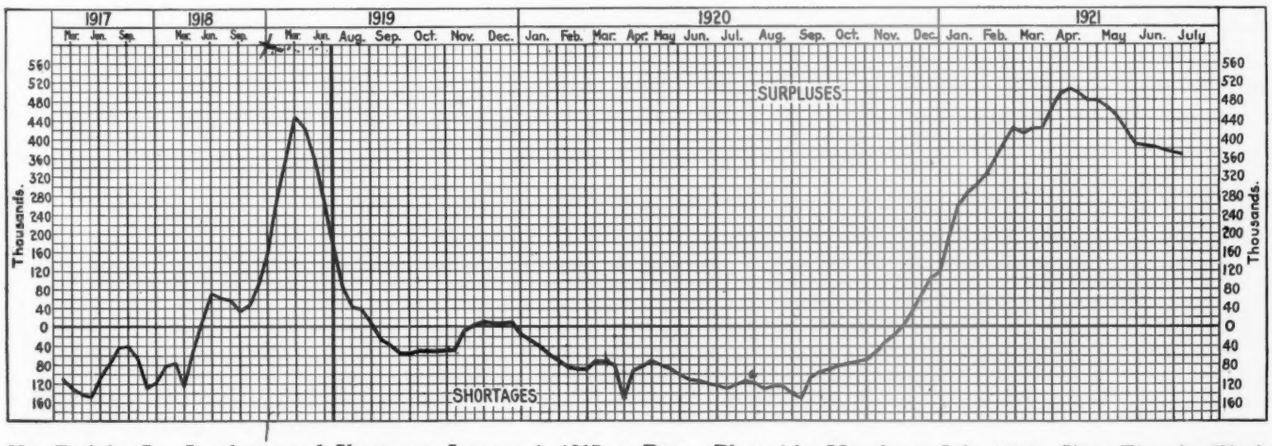
THE DATA which are given on preceding pages relative to revenue freight car loading and bad order freight cars would not be complete without the figures of car surpluses and shortages. There are given herewith, therefore, the figures from the beginning of 1917 to date. It will be seen that the peak of net car surplus was reached in April but that since that time the surplus has been gradually decreasing.

SUMMARY OF NET SHORTAGES AND SURPLUSES OF FREIGHT EQUIPMENT*

	Shortages	Surpluses
1917		
February 1	109,988	.....
March 1	130,082	.....
April 1	144,797	.....
May 1	148,627	.....
June 1	106,649	.....
July 1	77,144	.....
August 1	42,682	.....
September 1	40,122	.....
October 1	64,994	.....
November 1	130,478	.....
December 1	117,267	.....
1918		
January 1	79,738	.....
February 1	83,183	.....
March 1	127,117	.....
April 1	50,584	.....
May 1	.....	13,835
June 1	.....	71,224
July 1	.....	62,806
August 1	.....	58,434
September 1	.....	35,922
October 1	.....	45,740
November 1	.....	91,691
December 1	.....	156,827
1919		
January 1	.....	269,344
February 1	.....	354,452
March 1	.....	448,864
April 1	.....	426,424
May 1	.....	365,560
June 1	.....	284,828
July 1	.....	182,206
August 1	.....	88,629
" 8	.....	42,052
" 15	.....	37,517
" 23	.....	5,113
September 1	24,388	.....
" 8	37,244	.....
" 15	54,871	.....
" 23	58,200	.....
October 1	52,525	.....
" 8	53,482	.....
" 15	53,382	.....
" 23	52,995	.....
November 1	47,354	.....
" 8	5,770	.....
" 15	.....	7,229
" 23	.....	12,812
December 1	.....	9,357
" 8	.....	9,130
" 15	.....	12,093
" 23	16,636	.....
1920		
January 1	30,253	.....
" 8	40,981	.....
" 15	58,016	.....
" 23	69,156	.....
February 1	85,106	.....
" 8	88,454	.....
" 15	89,139	.....
March 1	69,200	.....
" 8	70,519	.....
" 15	79,640	.....
" 23	154,613	.....
April 8	88,624	.....
" 15	81,488	.....
" 23	69,782	.....
May 8	81,277	.....
" 15	88,517	.....
" 23	101,470	.....
June 1	110,687	.....
" 8	113,975	.....
" 15	119,926	.....
" 23	123,932	.....
July 1	129,193	.....
" 8	120,548	.....
" 15	113,829	.....
" 23	116,298	.....
August 1	129,959	.....
" 8	123,109	.....
" 15	123,993	.....
" 23	140,504	.....
September 1	151,223	.....
" 8	109,408	.....
" 15	95,723	.....
" 23	90,543	.....
October 1	83,508	.....
" 8	79,194	.....
" 15	72,551	.....
" 23	68,120	.....
November 1	55,856	.....
" 8	31,847	.....
" 15	19,068	.....
" 23	.....	2,488
" 30	.....	34,395
December 8	.....	69,073
" 15	.....	105,646
" 22	.....	118,667

	Total Surplus	Total Unfilled Car Requis.	Excess of Idle Cars
January 1	197,733	3,808	193,925
" 8	258,678	1,929	256,749
" 15	288,115	1,653	286,462
" 23	301,997	1,328	300,669
February 1	324,186	810	323,376
" 8	358,065	692	357,373
" 15	392,550	388	392,162
" 23	423,193	441	422,752
March 1	413,450	650	412,800
" 8	422,207	459	421,748
" 15	424,409	594	423,815
" 23	459,411	476	458,935
April 1	495,904	123	495,781
" 8	507,427	153	507,274
" 15	499,479	231	499,248
" 23	483,067	202	482,865
" 30	482,352	276	482,076
May 8	471,922	264	471,658
" 15	450,453	289	450,164
" 23	422,823	255	422,568
" 30	394,040	339	393,701
June 8	389,526	449	389,077
" 15	381,746	220	381,526
" 23	377,850	270	377,580
" 30	373,791	663	373,128
July 8	369,925	398	369,527
" 15	.....	...	.....

*As reported by Am. RR. Assn., Car Service Div.—February 1 to June 1, 1917. U. S. Railroad Administration—July 1, 1917, to December 31, 1919. Am. RR. Assn., Car Service Div.—January 1 to December 15, 1920.



Net Freight Car Surpluses and Shortages, January 1, 1917, to Date. Plotted by Months to July, 1919. Since Then by Weeks

Freight Car Loading

WASHINGTON, D. C.

LOADING of revenue freight totaled 776,252 cars during the week ended July 16, according to the reports of the Car Service Division of the American Railway Association. This was an increase of 136,554 cars over the preceding week when, however, the observance of Fourth of July resulted in a drop in the total.

The total for the week of July 16 was 166,599 cars less than were loaded during the corresponding week in 1920 and 126,044 less than were loaded during the corresponding week in 1919, but it was approximately 1,400 cars more than were loaded during the week which ended on July 2 last and which consisted of six full working days.

With the exception of coke, increases were reported in the loading of all commodities during the week of July 16, compared with the previous week. The largest increase was in the loading of merchandise and miscellaneous freight which includes manufactured products. This totaled 463,085 cars or an increase of 73,298 cars over the week before but 65,000 less than during the corresponding week last year.

Coal loadings totaled 152,116, which was an increase of 25,785 cars over the previous week. It was, however, approximately 55,000 cars under the total for the corresponding week in 1920 and 36,600 cars below the total for the corresponding week in 1919.

A gain of 18,976 cars in the number loaded with grain and grain products over the previous week was shown by reports, bringing the total for the week to 56,991 cars.

Loading of forest products during the week reached 44,037 cars, or an increase of 9,681 cars over the preceding week, while there was a gain of 5,172 in the number of cars loaded with ore, thus bringing the total for the week to 31,484. Re-

ports showed 24,802 cars loaded with live stock, which was an increase of 3,735 cars over the week before, while coke loadings totaled 3,737 cars or a decrease of 93 cars compared with the week of July 9.

With the exception of grain and grain products the total loading for each class of commodities during the week of July 16 was less than during the corresponding week in 1920.

Increases were reported in all districts over the week before.

Due principally to a reduction in the demand for coal cars in the Eastern district, an increase of 2,525 in the number of surplus cars during the week ended on July 15 was shown by reports received by the Car Service Division of the American Railway Association. The average for the week was 372,050 as compared with 369,525 for the preceding week. Surplus coal cars numbered 173,617, an increase of 12,011, while surplus box cars totaled 135,633, a decrease of 9,479. This increase was due largely to the increased demand for grain cars in the wheat sections.

In addition to the 372,050 surplus cars, reports just received by the Car Service Division show that on July 1 there were also 354,611 freight cars out of repair or 15.4 per cent of the cars on line. On June 15, there were 346,861 bad order cars or 15.1 per cent of the cars on line.

Movement of grain and grain products has recently been heavier than for the corresponding period of the past three years. From June 4 to July 16 inclusive, 297,881 cars were loaded with grain and grain products. This was 67,403 cars more than were loaded during the corresponding period in 1920 and 70,043 cars in excess of the total for the corresponding period in 1919. During the week which ended on July 16, according to reports received by the Car Service Division, 56,991 cars were loaded with grain and grain products which was an increase of approximately 19,000 over the preceding week. During the corresponding week in 1920, the total was only 33,967, and in 1919, 45,466 cars.

The big increase in the movement of grain over the preceding years has resulted in some difficulty being experienced at such points as Galveston and Chicago in the handling by the elevators of the increased volume but through the cooperation of the grain concerns and the railroads, which were represented by the Car Service Division, the situation is being cleared. At Galveston, it was necessary to place embargoes against certain elevators but these have since been lifted except by one road. Reports on Monday showed 3,061 cars of grain standing at Galveston and 8,000 cars at Chicago. Reports received by the Car Service Division show that 75 per cent of the Texas crop, which will move through Galveston for export, has already been loaded.

REVENUE FREIGHT LOADED AND RECEIVED FROM CONNECTIONS

SUMMARY—ALL DISTRICTS, COMPARISON OF TOTALS THIS YEAR, LAST YEAR, TWO YEARS AGO. FOR WEEK ENDED SATURDAY, JULY 9, 1921

Districts	Year	Grain and grain products	Live stock	Coal	Coke	Forest products	Ore	Mdse. L.C.L.	Miscellaneous	Total revenue freight loaded: This Year 1921	Corresponding Year 1920	Corresponding Year 1919	Received from connections: This Year 1921	Corresponding Year 1920	Corresponding Year 1919
Eastern	1921	5,765	2,163	34,518	636	3,717	2,029	47,719	56,782	153,329	.....	.....	161,703	.....	.....
	1920	5,020	2,046	51,115	2,737	6,907	9,053	22,132	91,052	.....	190,062	203,829	.....	243,403	211,144
Allegheny	1921	2,591	2,564	38,361	1,991	1,848	6,018	37,889	40,313	131,575	.....	.....	87,148	.....	.....
	1920	2,457	3,037	50,328	4,681	3,074	9,997	32,820	56,582	.....	162,976	181,203	.....	132,709	125,315
Pocahontas	1921	152	190	17,510	16	1,129	11	2,234	4,162	25,404	.....	.....	11,490	.....	.....
	1920	107	121	20,774	687	1,665	134	93	7,980	.....	31,561	38,889	.....	20,314	16,872
Southern	1921	2,835	1,895	16,470	386	11,976	302	29,740	32,130	95,734	.....	.....	58,377	.....	.....
	1920	2,967	2,291	26,308	165	15,011	2,519	24,925	42,992	.....	117,178	109,261	.....	71,541	55,213
Northwestern	1921	6,995	5,623	5,075	511	7,387	16,639	23,830	25,525	91,585	.....	.....	36,289	.....	.....
	1920	7,991	5,328	9,137	1,151	8,704	41,925	18,965	39,051	.....	132,252	134,783	.....	56,605	47,264
Central Western	1921	13,016	6,972	11,653	143	3,259	412	26,113	29,641	91,209	.....	.....	43,872	.....	.....
	1920	7,745	6,842	20,277	403	4,375	4,294	28,209	34,494	.....	106,639	98,160	.....	95,484	58,713
Southwestern	1921	6,661	1,660	2,744	147	5,040	901	13,133	20,576	50,862	.....	.....	36,050	.....	.....
	1920	3,506	2,232	6,188	103	6,275	642	14,253	22,324	.....	55,523	43,720	.....	43,941	39,608
Total all roads	1921	38,015	21,067	126,331	3,830	34,356	26,312	180,658	209,129	639,698	.....	.....	434,929	.....	.....
	1920	29,793	21,897	184,127	9,927	46,011	68,564	141,397	294,475	.....	796,191	.....	.....	633,997	.....
	1919	31,673	24,769	191,532	.....	50,803	66,362	.....	444,706	.....	.....	809,845	.....	.....	554,129
Increase compared	1920	8,222	.....	.....	.....	.....	.....	39,261	.....	.....	.....	.....	.....	.....	.....
Decrease compared	1920	.....	830	57,796	6,097	11,655	42,252	.....	85,346	156,493	.....	.....	199,068	.....	.....
Increase compared	1919	6,342	.....	.....	3,830	.....	.....	180,658	.....	.....	.....	.....	.....	.....	.....
Decrease compared	1919	.....	3,702	65,201	.....	16,447	40,050	.....	235,577	170,147	.....	.....	119,200	.....	.....

L. C. L. Merchandise loading figures for 1921 and 1920 are not comparable, as some roads are not able to separate their L. C. L. freight and miscellaneous of 1920. Add merchandise and miscellaneous columns to get a fair comparison.

July 2	1921	40,547	24,923	157,265	4,354	47,542	30,335	215,887	253,955	774,808	891,621	743,226	511,035	651,932	584,596
June 25	1921	38,821	28,223	156,999	4,557	49,427	28,921	215,678	252,429	775,061	911,503	845,684	516,603	664,420	591,200
June 18	1921	40,994	28,541	157,243	5,102	50,472	28,866	215,622	253,901	780,741	916,736	807,907	514,358	675,443	574,895
June 11	1921	41,119	29,135	163,088	4,788	51,393	30,179	215,740	253,555	788,997	930,976	807,205	509,129	681,514	563,838

RFVENUE FREIGHT LOADED AND RECEIVED FROM CONNECTIONS

SUMMARY—ALL DISTRICTS, COMPARISON OF TOTALS THIS YEAR, LAST YEAR, TWO YEARS AGO. FOR WEEK ENDED SATURDAY, JULY 16, 1921

Districts:	Year	Grain and grain products	Live stock	Coal	Coke	Forest products	Ore	Merchandise L.C.L.	Miscellaneous	Total revenue freight loaded: This year 1921	Corresponding year 1920	Corresponding year 1919	Received from connections: This year 1921	Corresponding year 1920	Corresponding year 1919
Eastern	1921	9,430	2,668	41,926	810	4,441	1,775	55,894	71,172	188,116	.....	.....	181,537	.....	.....
	1920	5,927	2,609	58,164	2,760	8,771	8,863	34,685	106,487	.....	228,266	219,296	.....	262,919	231,689
Allegheny	1921	4,004	2,888	45,428	1,850	2,537	7,073	41,825	49,934	155,539	.....	.....	98,804	.....	.....
	1920	2,130	2,716	59,228	5,818	3,154	10,347	38,263	70,426	.....	192,082	189,811	.....	141,590	136,610
Pocahontas	1921	254	222	20,299	30	1,394	23	2,603	4,782	29,607	.....	.....	12,225	.....	.....
	1920	156	146	21,931	743	1,986	220	3,099	6,337	.....	34,618	36,634	.....	20,914	18,348
Southern	1921	4,167	2,083	19,586	238	13,959	288	34,019	35,249	109,589	.....	.....	62,593	.....	.....
	1920	2,841	2,293	26,777	515	16,268	3,235	31,459	45,739	.....	129,127	116,723	.....	78,780	69,085
Northwestern	1921	9,096	6,609	6,456	493	11,006	20,955	27,868	34,269	116,752	.....	.....	40,513	.....	.....
	1920	8,822	7,300	11,470	1,301	13,582	49,756	22,554	53,719	.....	168,504	161,476	.....	62,306	61,656
Central Western	1921	20,447	8,184	14,233	169	4,732	576	30,681	35,299	114,321	.....	.....	47,348	.....	.....
	1920	9,611	8,660	23,455	430	5,775	5,122	33,654	40,554	.....	127,261	115,241	.....	66,624	61,862
Southwestern	1921	9,593	2,148	4,188	147	5,968	794	15.189	24,301	62,328	.....	.....	41,280	.....	.....
	1920	4,480	2,919	6,400	101	7,264	679	17,158	23,992	.....	62,993	63,115	.....	48,551	48,591
Total, all roads	1921	56,991	24,802	152,116	3,737	44,037	31,484	208,079	255,006	776,252	.....	.....	484,300	.....	.....
	1920	33,967	26,643	207,425	11,668	56,800	78,222	180,872	347,254	.....	942,851	.....	.....	681,684	.....
	1919	45,466	33,487	188,750	.....	61,678	78,960	109,116	384,839	.....	.....	902,296	.....	.....	627,841
Increase compared	1920	23,024	.....	.....	.....	.....	.....	27,207	.....	.....	.....	.....	.....	.....	.....
Decrease compared	1920	.....	1,841	55,309	7,931	12,763	46,738	.....	92,248	166,599	.....	.....	197,384	.....	.....
Increase compared	1919	11,525	.....	.....	3,737	.....	.....	98,963	.....	.....	.....	.....	.....	.....	.....
Decrease compared	1919	.....	8,685	36,634	.....	17,641	47,476	.....	129,833	126,044	.....	.....	143,541	.....	.....

L.C.L. Merchandise loading figures for 1921 and 1920 are not comparable as some roads are not able to separate their L.C.L. freight and miscellaneous of 1920. Add merchandise and miscellaneous columns to get a fair comparison.

July 9	1921	38,015	21,067	126,331	3,830	34,356	26,312	180,658	209,129	639,698	796,191	809,845	434,929	633,997	554,129
July 2	1921	40,547	24,923	157,265	4,354	47,542	30,335	215,887	253,955	774,808	891,621	743,226	511,035	651,932	584,596
June 25	1921	38,821	28,229	156,999	4,557	49,427	28,921	215,678	252,429	775,061	911,503	845,684	516,603	664,420	591,200
June 18	1921	40,994	28,541	157,243	5,102	50,472	28,866	215,622	253,901	780,741	916,736	807,907	514,358	675,443	574,895

Locomotive Resistance and Mechanical Efficiency

Investigation Shows Resistance Can Best Be Expressed in Terms of Mechanical Efficiency

By Kiichi Asakura
Mechanical Engineer, Japanese Government Railways, Tokio, Japan

WHEN A LOCOMOTIVE runs with a uniform speed on a level tangent track, it requires some force to maintain its motion. This force is used to overcome the locomotive resistance which is the sum of the following resistances:

(a) Resistance of the driving gear, i.e., that of the piston, piston rod, valve gear, crosshead, crank pin, etc., and resistance caused by the impact of the reciprocating parts. This resistance combined with that of (b), explained below, corresponds to the machine friction of the usual steam engine.

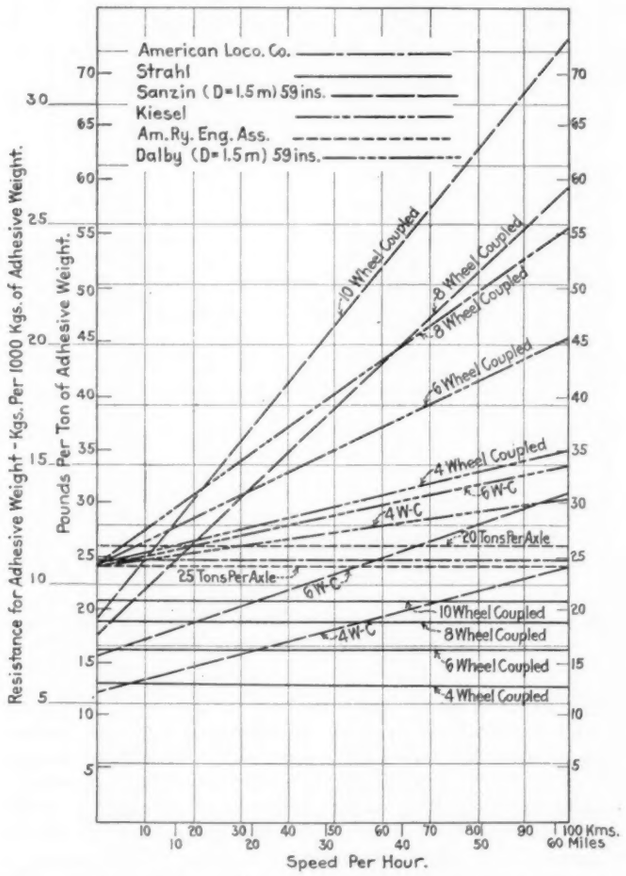


Fig. 1.—Several Locomotive Resistance Formulæ Plotted for Comparison

(b) Resistance at the journal of the axle due to friction.

(c) Resistance between the wheel and the rail, i.e., rolling friction of the wheel upon the rail, that caused by the slipping of the wheel tread and flange on the rail, and that due to the deformation of the rail.

(d) Air resistance.

(e) Miscellaneous resistances, i.e., resistances at buffers, couplings, those due to vibration, etc.

Among the above mentioned resistances that of (a) exists only in the locomotive, while the others exist both in the locomotive and in the cars, and for this reason the locomotive resistance is greater than the car resistance (for a given weight). The fact that the locomotive resistance is greater to a considerable extent than the car resistance shows that the resistance (a) constitutes an important part of the locomotive resistance, and therefore the locomotive resistance becomes the greater as the driving gear becomes more complicated and bigger. In the resistance formulæ recently published by several authors, the above idea was taken into consideration and the formulæ include generally the three following terms:

1. Resistance caused by the weight on truck wheels and tender.
2. Resistance caused by the adhesive weight.
3. Air resistance.

The old resistance formulae do not differentiate the above terms.

Resistance caused by the weight on truck wheels and tender is independent of the driving gear and therefore this resistance may be treated as that of a car of the same weight per axle. Air resistance is independent of the locomotive weight and may be considered separately from other parts of the locomotive resistance.

Resistance caused by the adhesive weight is the resistance

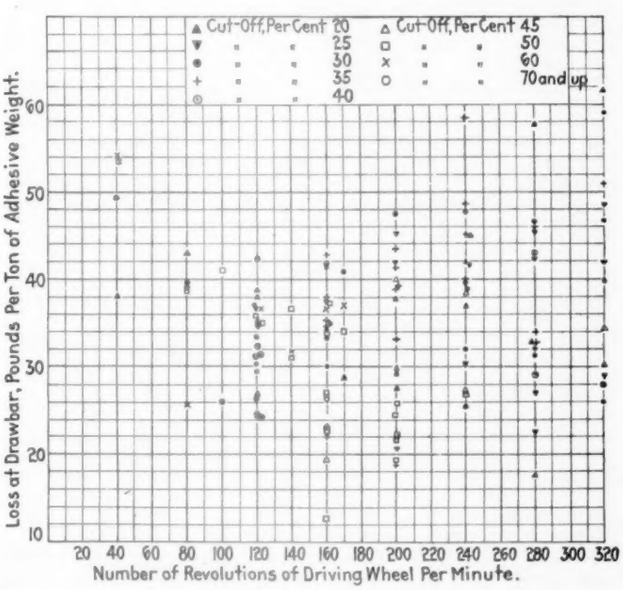


Fig. 2.—Locomotive Resistance Plotted with Speed as a Base

mentioned under items (b), (c), (e), and the resistance of the total driving gear (a). This resistance is very complicated and is calculated by several empirical formulae. But the results of the calculation by several formulae differ from each other in very great amounts and often do not coincide with the experimental data. The object of this work is to determine how to calculate the resistance caused by the ad-

hesive weight, to make the calculated results coincide with experimental results closer than the usual formulae.

Experimental Data

If the locomotive resistance is measured by a test on an actual road, it is almost impossible to separate therefrom the resistance caused by the adhesive weight alone. Moreover, the experimental data usually contain several irregular factors resulting from lack of such long straight track, of level or uniform gradient, as to enable the running conditions to be kept uniform. If, on the contrary, the locomotive resistance is measured in the testing plant, the resistance caused by the adhesive weight alone is measured and moreover in such a test the tractive force, speed, throttle opening, cut off duration of test, etc., may be regulated as is demanded. For this reason, the experimental data obtained in the testing plant are more exact and reliable and should be taken as the basis for the investigation of the locomotive resistance caused by the adhesive weight. The experimental data obtained in Purdue University, at the St. Louis Exposition, at the Altoona Testing Plant of the Pennsylvania Railroad, in Illinois University, at our Oi Testing Plant, etc., are applicable for that purpose.

The resistance measured in the testing plant will be different from that obtained by road test in the amount of the resistances between wheels and rails and miscellaneous resistances. But since these resistances constitute only a small part of the total resistance, excepting the case of a very bad road, this difference has no great effect upon the determination of the locomotive resistance. Moreover, since the resistances of several locomotives differ from each other to a considerable extent and it is almost impossible to establish a formula exactly applicable to every locomotive, as will be shown hereafter, the experimental data in the testing plants may be adopted, without a serious error, as the basis of the determination of the locomotive resistance. Thus in this investigation the data of the following simple locomotives in the above mentioned tests are adopted and for the estimation of the steam consumption, the experimental data of the superheater locomotives at Altoona Testing Plant alone are adopted.

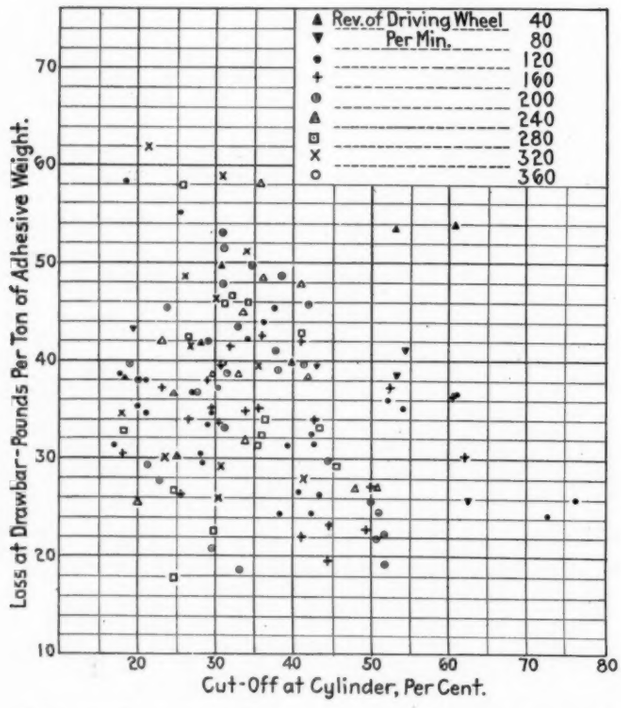


Fig. 3.—Locomotive Resistance Plotted on the Basis of Cut-off

TABLE I

Name of railroad	Testing plant	Type of locomotive	No. of tests
Pennsylvania	Altoona	4-4-2 Sup. (No. 51)	30
Pennsylvania	Altoona	4-4-2 Sup. (No. 89)	27
Pennsylvania	Altoona	4-6-2 Sup. (No. 877)	29
Pennsylvania	Altoona	2-8-2 Sup. (No. 1752)	29
Illinois Central	Univ of Ill.	2-8-0 Sat.	
Pennsylvania	St. Louis Exp.	2-8-0 Sat. (No. 1499)	17
L. S. & M. S.	St. Louis Exp.	2-8-0 Sat. (No. 734)	21

Formulae Usually Used

The resistance formula usually used expresses the resistance in the form of so many pounds per ton of the adhesive weight; that is to say, the resistance is considered to be proportional to the weight. As the internal friction of the engine constitutes the essential part of the resistance, several authors made their formulae in such form that the construction of the locomotive and the number of revolutions of the driving wheels have some effect upon the amount of the resistance. But other authorities considered the resistance to be independent of such factors. The following are well known formulae usually used.

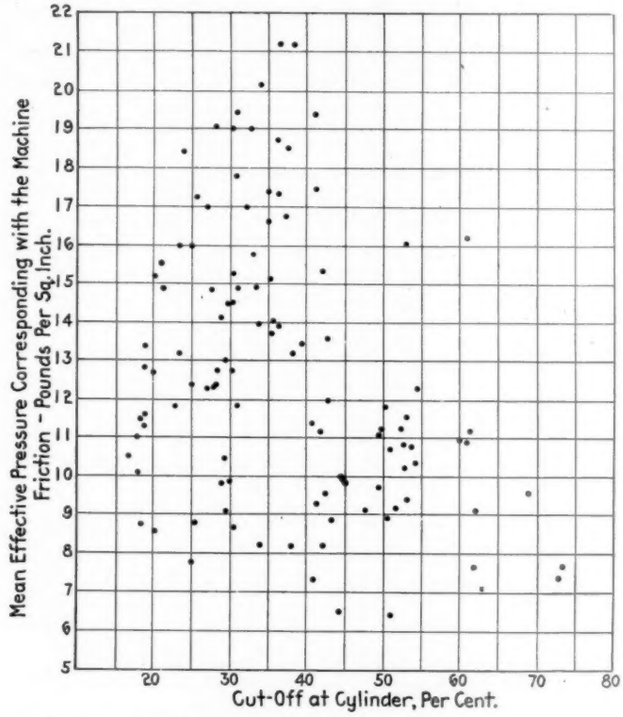


Fig. 4.—Resistance Expressed as Mean Effective Pressure and Plotted with Cut-off as a Base

(1) Formula of the American Locomotive Company.

The resistance is stated to be 22.2 lb. per short ton (25 lb. per long ton or 11 kg. per 1,000 kg.) or the resistance is independent of locomotive construction and speed (for the Mallet type, greater resistance is adopted). This formula is very simple, but it is not certain whether the resistance may be expressed so simply.

(2) Strahl's formula.

Type of locomotive	Resistance in lb. per ton	Resistance in kgs. per 1,000 kgs.
4 Wheel-coupled, 2 cyls.	13.0	5.8
6 Wheel-coupled, 2 cyls.	16.4	7.3
8 Wheel-coupled, 2 cyls.	18.8	8.4
10 Wheel-coupled, 2 cyls.	20.8	9.3

The resistance is considered to be independent of the speed but to increase as the number of coupled axles increases.

As the number of coupled axles increases the construction becomes so much more complicated and therefore the total resistance will increase. But as the adhesive weight increases at the same time, it is not certain that the specific resistance increases as the number of coupled axles. In our Oi Testing Plant, we have found that the specific resistance increased to a considerable amount when we made a test of a 4-wheel-coupled locomotive which was made temporarily a 4-wheel-coupled by taking off a pair of coupling rods of the 6-wheel-coupled engine. The resistance of such a 4-wheel-coupled locomotive may differ from that of a well proportioned

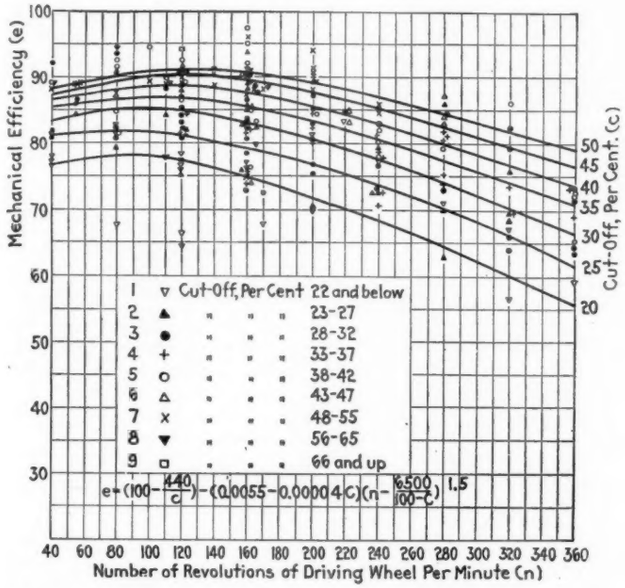

Mechanical Efficiency (e)
Cut-Off, Per Cent. (c)
1 ▽ Cut-Off, Per Cent 22 and below
2 ▲ " " " 23-27
3 ● " " " 28-32
4 + " " " 33-37
5 ○ " " " 38-42
6 △ " " " 43-47
7 × " " " 48-55
8 ▼ " " " 56-65
9 □ " " " 66 and up
Number of Revolutions of Driving Wheel Per Minute (n)

Fig. 5.—Mechanical Efficiency Bears a Definite Relation to Speed and Cut-off

4-wheel-coupled locomotive, but this test may serve to indicate the fact that the specific resistance does not increase as the number of axles.

(3) Sanzin's formula:

Resistance in lb., per ton: $a' + \frac{b' v'}{D' 10}$

Resistance in kg. per 1,000 kg.: $a + \frac{b v}{D 10}$

D' = dia. of the driving wheel in feet.
v' = speed in miles per hour.
D = dia. of the driving wheels in meters.
v = speed in km. per hour.
$a', b', a, b,$ = constants as follows:

	a'	b'	a	b
4 Wheel coupled	12.3	9.5	5.5	0.8
6 Wheel coupled	15.7	11.8	7.0	1.0
8 Wheel coupled	18.0	33.1	8.0	2.8
10 Wheel coupled	19.8	42.5	8.8	3.6

This formula indicates that the greater the number of coupled axles the greater is the resistance, and therefore may not represent a true resistance as was shown in the case of Strahl's formula. In fact several resistance formulae were made as the results of experiments on German and Austrian railways. The run off test, the throttle being shut, was usually applied for the determination of the frictional loss. However, since, as is shown hereafter, the frictional loss is much dependent upon the power developed, the run off test result ought not to be as well suited for the determination of the frictional loss as the results obtained in a testing plant.

The second term of this formula contains $\frac{v}{D}$ which represents the number of revolutions of the driving wheel. Sanzin assumes simply that the resistance will be increased if the number of revolutions increases. This assumption seems to be right as is shown hereafter.

(4) Kiesel's formula:

$22 + 0.15\ (n-1)\ v'$, lb. per short ton.
$24.6 + 0.168\ (n-1)\ v'$ lb. per long ton.
$10.9 + 0.0467\ (n-1)\ v$, kg. per 1,000 kg.
v' = speed in miles per hour.
v = speed in km. per hour.
n = number of coupled axles.

This formula also shows that the resistance increases with the number of coupled axles but the rate of increase is small. When the axles are coupled together each is dependent upon the motion of the other, and so resistance due to slip between wheels and rails may increase. This formula also shows that the resistance increases with the speed. Since, however, only the second term of the formula is dependent upon speed, the increase of specific resistance with the speed is only little. That the second term, which is comparatively a small part of the resistance, is dependent upon the speed and the number of coupled axles, may prove that the second term represents essentially the resistance between wheels and rails. Then this formula shows that the essential part of the resistance is constant and is nearly equal to that given by the formula of the American Locomotive Co.

(5) Formula of the American Railway Engineering Association:

$$18.7 + \frac{80n}{W'} \text{ lb. per short ton}$$

$$21. + \frac{80n}{W''} \text{ lb. per long ton}$$

$$9.4 + \frac{36n}{W} \text{ kg. per 1,000 kg.}$$

W' = Adhesive weight in short tons
W'' = Adhesive weight in long tons
W = Adhesive weight in metric tons
n = No. of coupled axles

This formula shows that the greater part of the resistance is constant and the remaining part increases in inverse pro-

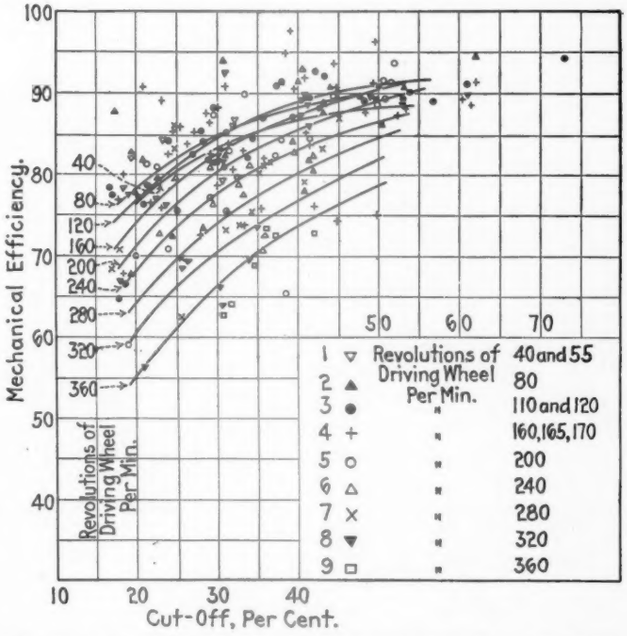

Mechanical Efficiency.
Revolutions of Driving Wheel Per Min.
1 ▽ Revolutions of Driving Wheel Per Min. 40 and 55
2 ▲ 80
3 ● 110 and 120
4 + 160, 165, 170
5 ○ 200
6 △ 240
7 × 280
8 ▼ 320
9 □ 360
Cut-Off, Per Cent.

Fig. 6.—Mechanical Efficiency at Various Speeds on the Basis of Cut-off

portion to the axle load. In America the resistance of 22.2 lb. per short ton is adopted very often and it is usually said that about 80 per cent of the above value corresponds to the internal resistance. Then the first term of the formula may represent the internal resistance, and the second term may represent the resistance between wheels and rails. That the

resistance decreases when the axle load increases is coincident with the experimental results of cars in America.

(6) Dalby's formula:

$$\frac{120}{D'} + 0.05\ n\ v', \text{ lb./ton} \qquad \frac{16.3}{D} + 0.0138\ n.\ v, \text{ kg. per 1,000 kg.}$$

D′ — dia. of driving wheel in feet
D — dia. of driving wheel in meters
v′ — speed in miles per hour
v — speed in kilometers per hour
n — number of coupled axles

In Dalby's formula the resistance is given in the form of so many pounds per ton of the total weight. But when we consider only the part of the resistance caused by the adhesive weight the formula takes the above form.

The first term of this formula shows the internal resistance and was determined from some special case of Prof. Goss's experiments. The second term represents the resistance between wheels and rails and was estimated from the experimental data of a 4-4-0 type locomotive.

Beside the formulae above mentioned there are still many other formulae. Since, however, these formulae usually express the resistance per ton of total weight, and it is impossible to separate the resistance only due to the adhesive weight, neither comparison nor discussion was made about these formulae.

As was explained already, all the above formulae have some defect in their forms, when we consider them theoretically. The above formulae are plotted in a diagram, Fig. 1, which shows how great a deviation exists among them. In fact each formula may represent the experimental result of one locomotive, but it is not applicable to another locomotive and perhaps to any other case.

Table II shows the mean resistance by the adhesive weight obtained by experiments of locomotives given in Table I and also of other locomotives tested at the St. Louis Exposition:

TABLE II

Name of railway	Locomotive type	Adhesive weight	Resistance by adhesive weight: lb. per ton	Resistance by adhesive weight: Kg. per 1,000 kg.
Pennsylvania	4-4-2 Sup.	63.0	43.3	19.3
Pennsylvania	4-4-2 Sup.	59.5	31.7	14.1
Pennsylvania	4-4-2 de Glehn Comp.	39.2	26.3	11.7
Pennsylvania	4-4-2 Baldwin Comp.	44.2	44.5	19.9
Pennsylvania	4-4-2 Honnover Comp.	29.2	26.1	11.6
Pennsylvania	4-4-2 Cole Comp.	49.2	30.4	13.6
Pennsylvania	4-6-2 Sup.	80.3	31.0	13.8
Pennsylvania	2-8-2 Sup.	105.0	36.7	16.4
Illinois Central	2-8-0	89.7	28.3	12,6
Pennsylvania	2-8-0	77.4	45.5	20.3
	2-8-0	72.6	23.5	10,5
Michigan Central	2-8-0	73.5	24.8	11.1
	2-10-6 Tandem Comp.	104.0	36.0	16.1

As is observed from the table the resistanec of the locomotive with more coupled axles is not greater than that of the locomotive with less coupled axles. Moreover, the resistance of locomotives with the same number of coupled axles differs to a very great extent. Thus the above experimental results do not justify the correctness of expressing the resistance in terms of the number of coupled axles.

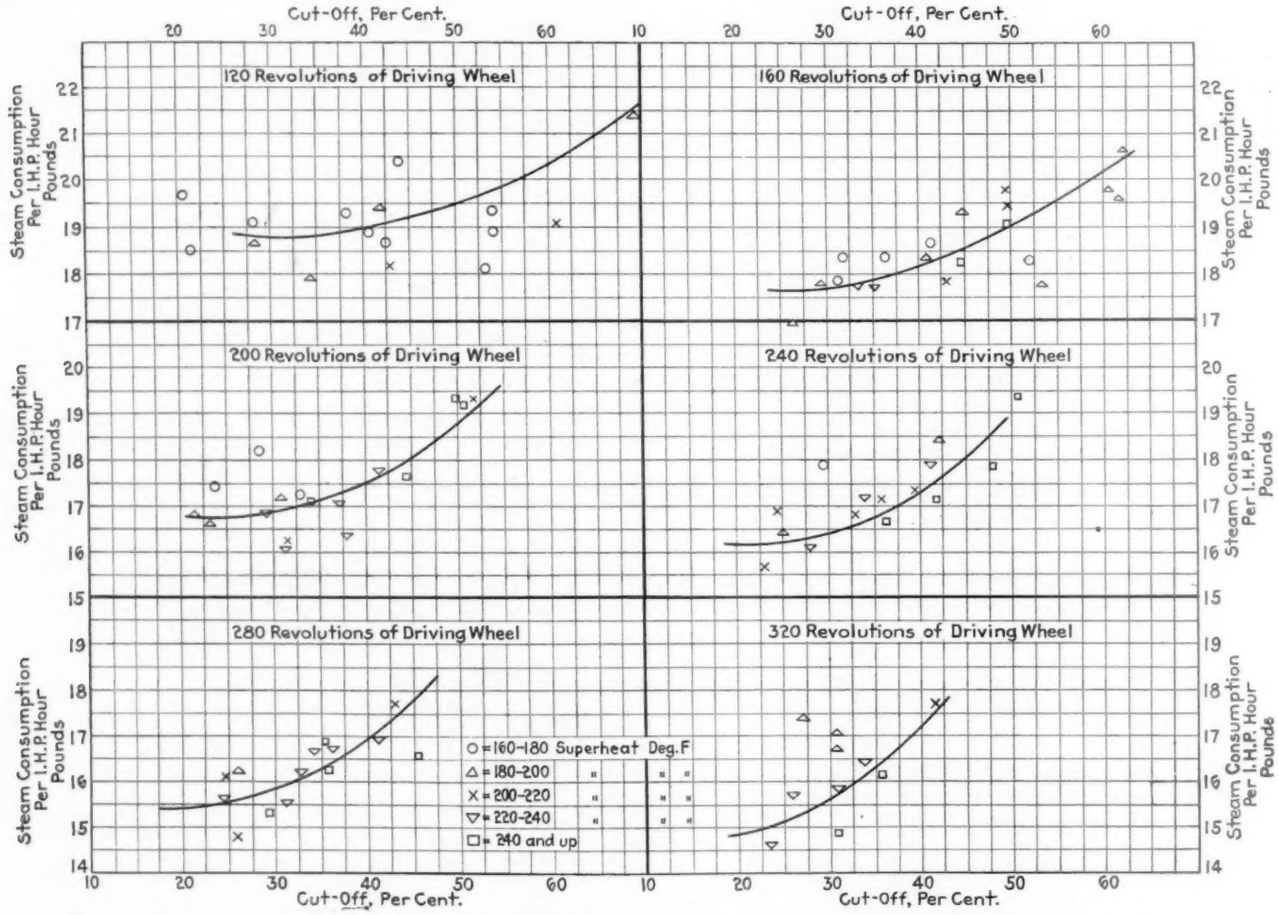

120 Revolutions of Driving Wheel
160 Revolutions of Driving Wheel
200 Revolutions of Driving Wheel
240 Revolutions of Driving Wheel
280 Revolutions of Driving Wheel
320 Revolutions of Driving Wheel
Cut-Off, Per Cent.
Steam Consumption Per I.H.P. Hour Pounds
○ = 160-180 Superheat Deg. F
△ = 180-200 " " "
× = 200-220 " " "
▽ = 220-240 " " "
□ = 240 and up

Fig. 7.—Steam Consumption Per Indicated Horsepower Hour at Various Speeds and Cut-offs

To find out if there is some relation between the resistance per ton weight and the number of revolutions of the driving wheels or cut off in the cylinders, the experimental results of the locomotives in Table I are plotted in Figs. 2 and 3. From these diagrams we cannot observe any regular relation, except that the resistance may be dependent upon the number of revolutions. The spots representing the resistance are distributed irregularly between 13 lb. and 63 lb. Even if we eliminate the specially high and low values, they are scattered between 20 and 50 lb. These figures may serve to

prove that the resistance ought not to be expressed in the form of so many pounds per ton weight, although such form is usually adopted.

Resistance and Mean Effective Pressure in the Cylinder

Since the internal resistance is to be dependent upon the size of the driving gear, and the steam pressure in the cylinder ought to have some effect upon the resistance, there is some hope that the resistance may be expressed as a function of the mean effective pressure in the cylinder. Prof. Goss gives in his work the following values of the mean effective pressure, which corresponds to the resistance, stating that it is almost independent of the speed, and decreases with the later cut off.

TABLE III

Cut off, per cent.....		25	35	45	80
M. E. P. corresponding to the resistance.....	lb. per sq. in.	5.29	4.18	3.57	1.69
	kg. per sq c.m.	0.372	0.294	0.251	0.119

Resistance and Mechanical Efficiency

As the internal friction loss of steam engines is expressed in the form of the efficiency, it is quite natural to investigate whether the locomotive resistance may be expressed in the form of the efficiency. The mechanical efficiency of the locomotives of Table I is plotted in connection with the number of revolutions of the driving wheel and the cut off in the cylinder, as shown in Figs. 5 and 6. Though we find from these figures that the relation between these factors is not regular enough, it is still by far more regular than the case in which the resistance is expressed in terms of unit weight or of mean effective pressure. As the design, workmanship, lubrication, etc., differ in each locomotive, it will be impossible to expect the experimental results of several locomotives to coincide and to give sufficiently regular relations between the mechanical efficiency and number of revolutions or mean effective pressure. We can acknowledge from Fig. 5 that the efficiency increases slightly as the number of revolutions of the driving wheel increases, so long as the number of revolutions is small, and then the efficiency decreases as the number of revolutions increases. The loss due to impact of the reciprocating parts will be greater at a high number of revolutions, and this may be the cause of the decline in the efficiency at high speed. Fig. 6 shows that the efficiency increases with the later cut off. The rate of change of force acting in every part of the driving gear decreases with the later cut off and this may be the cause of rise in the efficiency at the later cut off. Figs. 5 and 6 each represent the relation of the efficiency, number of revolutions and cut off. Though in each figure the points are distributed in a rather too irregular order to trace curves representing the relation, the other figure serves to aid in the curve tracing,

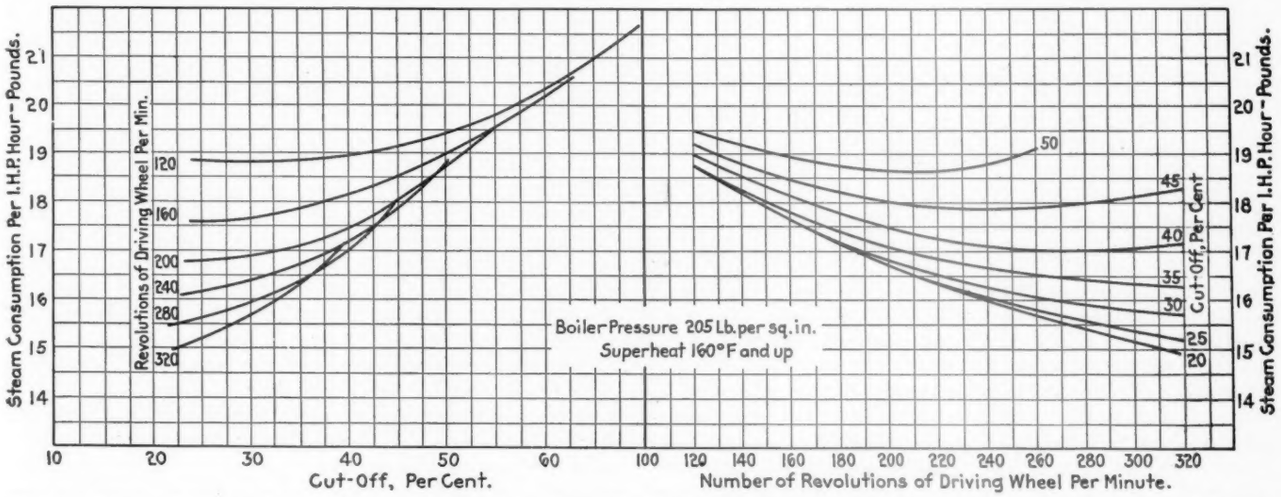


Fig. 8.—Steam Consumption of Superheated Locomotives Per Indicated Horsepower Hour at Various Cut-offs and Speeds

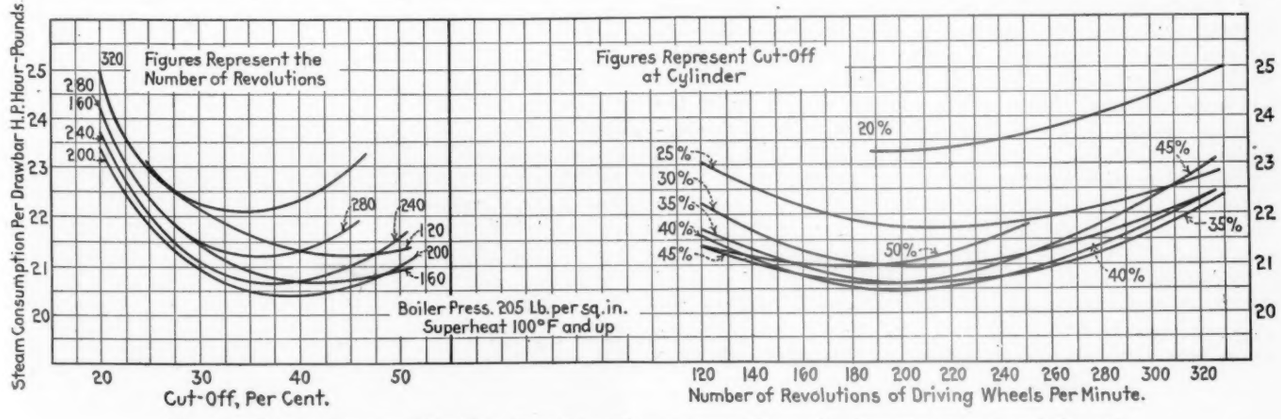


Fig. 9.—Steam Consumption Per Drawbar Horsepower Hour with Varying Speed and Cut-off

because the relation given by the two figures must be the same. Thus the curves in Figs. 5 and 6 were drawn and are represented by the following equations:

$$e = \left(100 - \frac{440}{c}\right) - (0.0055 - 0.00004\,c)\left(n - \frac{6500}{100 - c}\right)^{1.5}$$

e = mechanical efficiency.
c = cut off in per cent.
n = number of revolutions of driving wheels per min.

The maximum efficiency is given by the following equations:

$$e\ max = 100 - \frac{440}{c}$$

The number of revolutions with which the efficiency should be maximum is given by the following equation:

$$n' = \frac{6500}{100 - c}$$

Application of the Efficiency Formula for the Determination of the Tractive Force

The most usual application of the resistance formula is to find out the effective tractive force from the indicated tractive force. The efficiency formula may also be applied for the same purpose, though the calculation in this case is not so simple, as the case in which resistance is expressed in terms of unit weight. In such calculation the steam evaporation of the boiler and the steam consumption per indicated horse power hour are estimated and thus the indicated horse power developed by the locomotive is calculated, from which the indicated tractive force is calculated. By deducting the locomotive resistance from the indicated tractive force, the available tractive force is calculated.

Now, by using the above efficiency formula, we can calculate the steam consumption per drawbar horsepower hour corresponding to several numbers of revolutions and cut offs. Then the drawbar horsepower which can be developed by the locomotive, can be calculated. Thus the effective drawbar pull can be obtained if the proper care be taken in determining the resistance due to the weight on truck wheels and tender and the air resistance. The calculation of the drawbar pull as above explained is to be applied to the case in which the drawbar pull is limited by the boiler capacity or the speed is not very low. If the speed is low the drawbar pull is limited either by the adhesive weight or by the cylinder effort. The drawbar pull calculated from the adhesive weight is the effective drawbar pull, so that there is no need of considering the internal resistance.

Now to consider the cylinder tractive effort, we take the mechanical efficiency from Fig. 5 at 90 per cent, since the speed is low. The steam pressure drop from the boiler up to the cylinder may be taken from the experimental data of the locomotives previously mentioned being at most 5 per cent, at low speeds. Then the total loss is 15 per cent, or, as is usually adopted in America, the tractive effort can be expressed as follows:

$$T = \frac{0.85\ Pd^2l}{D}$$

T = Tractive effort.
P = Boiler pressure.
d, l = Dia. and stroke of cylinder.
D = Dia. of driving wheel.

When the locomotive runs without steam the resistance will be different, but this case is not treated here.

Steam Consumption

Steam consumption is considered only in the case of the superheater locomotive. The steam consumption depends upon the number of revolutions, cut off and steam temperature. Thus the steam consumption per indicated horse power hour is plotted in connection with the cut off, for 120, 160, 200, 260, 280 and 320 r. p. m., as shown in Fig. 7. There is some tendency for the steam consumption to decrease when the steam temperature increases. Since, however, the difference is small, when the superheat is more than 160 deg. F. (89 deg. C.) the steam consumption is assumed to be independent of the superheat, provided that the superheat is considerably high. Then the steam consumption per indicated horse power hour is represented in connection with the number of revolutions and cut off as shown in Fig. 8. By dividing the steam consumption thus obtained by the corresponding mechanical efficiency, we get the steam consumption per draw bar horse power as shown in Fig. 9. The value of this figure is to be applied to the calculation of the tractive force.

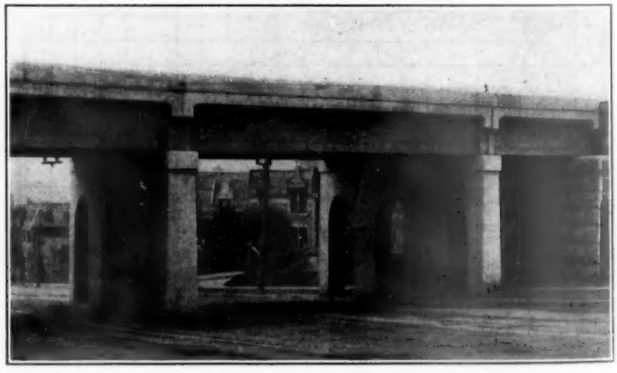
Conclusion

It was explained that it was more rational to consider the locomotive resistance in terms of mechanical efficiency than in terms of unit weight as was usually done. The formula for the mechanical efficiency was established. Also the steam consumption was investigated in connection with the number of the revolutions and cut off, and thus the more rational method of calculation of draw bar pull was introduced.

Since for the experimental data for the steam consumption, those of the superheater locomotives of Pennsylvania Railroad were adopted, the result obtained should be applied strictly speaking only to superheater locomotives having a boiler pressure of 205 lb. per sq. in. But the result will be applicable to all the superheater locomotives commonly used without serious error.

Canadian Pacific Uses Heavy Slabs for Bridge Spans

WHILE NOT THE FIRST to use reinforced concrete slabs for bridge or trestle spans, the Canadian Pacific has probably carried this development as far as any railroad in North America as regards the use of long spans. Thus, in 1918 labs in 36 ft. and 34 ft. lengths were used for the decks of an unusual reinforced concrete trestle carrying a double-track main line over a gorge 100 ft. deep and nearly 400 ft. wide just east of North Toronto. This structure was described in the *Railway Age* of August 16, 1918, page 289. Another application is illustrated in the photograph showing the use of 36-ft. slabs for a grade separation subway in Montreal. Slabs of this kind have now been standardized in various lengths up to 35 ft. 4 in. and feature in the renewal of pile trestles and steel girder spans. In this connection they are sometimes hauled distances of as much



Street Subway in Montreal Involving the Use of 36 Ft. Slabs for the Roadway Spans

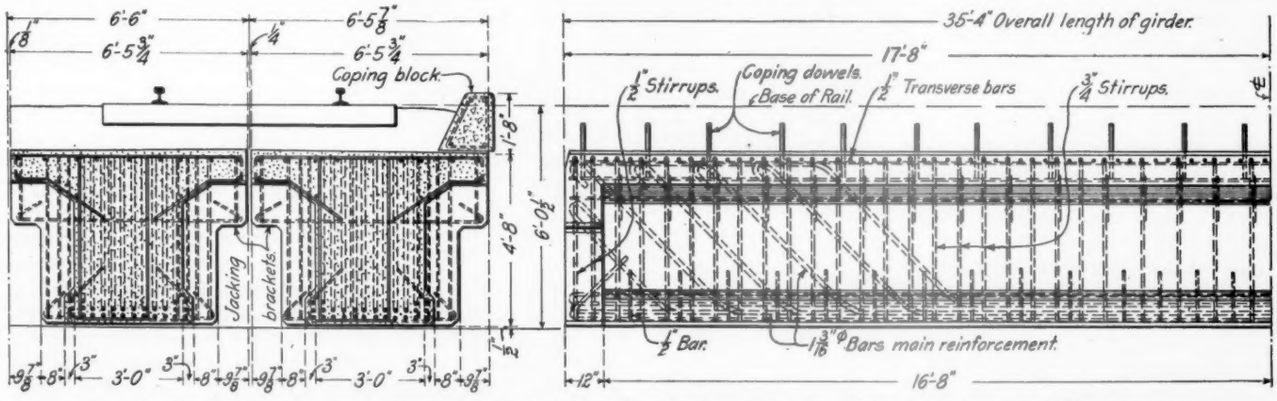
as 300 miles from the casting yard to the bridge site. The 34-ft. 4-in. slabs weigh 101,000 lb. each.

The design of the slab follows the generally accepted practice. Rectangular section slabs are used for lengths under 20 ft. while the slabs 20 ft. long and over are of the T-section illustrated in the drawing. All slabs are made 6 ft. 6 in. wide, thus requiring two for each track and as the parapet is cast separately all the slabs are alike except those having ends carried on abutments without backwalls which must be

View Underneath, Showing the T-Beam Construction

provided with diaphragms to fill in the open space under the flanges of the T-slabs.

The concrete is composed of 1-1½-3 mixture, using sand and broken stone for the aggregate. About 300 lb. of reinforcing material is required per cubic yard of concrete and this is of medium open-hearth steel. The bars are usually ordered of the manufacturer to be delivered cut to required lengths and bent according to a detailed bending diagram, the bars being tagged with an identifying mark.



Longitudinal Elevation and Cross Section of the Standard 35 ft. 4 in. Slabs Showing the Reinforcement

Special attention is given to the bearings of the slabs on the substructures, these bearings being provided with steel bearing plates held in place on the cap or bridge seat by means of dowels. No connection is provided between the slabs and the bearing plates.

For waterproofing, the top surface, ends, inside of the flanges and the underside and inside of coping blocks are covered with two coats of hot asphalt. The joints between slabs are caulked with oakum or other suitable fabric saturated with the asphalt. The usual practice is to erect the slabs by means of wrecking cranes. For all except the lighter slabs, which are fitted with lifting stirrups projecting from the top of the slabs, a special sling is used which is carried by lifting rods passing through four 2¼-in. diameter holes (two near each end of slab) placed at such distance from the end as to be well clear of the bearing in order that tackle may be released when the slab is landed.

We are indebted for the above information to J. M. R. Fairbairn, chief engineer, Canadian Pacific, Montreal, Que. P. B. Motley, engineer of bridges, was responsible for design.

Shall the Crossing Alarm Whistle Be Modified?

By E. H. Hemus

Assistant Claim Agent, Atchison, Topeka & Santa Fe

To meet the increased danger incident to the enormous number of high-speed automobiles now in use on our highways, it has been proposed to improve the whistle signal, to be given from the locomotive, with a view to more effectively safeguarding traffic at highway crossings. It has been suggested that it might be well to sound the whistle continuously from the whistling post to the crossing; but no practical operating officer sees any merit in that proposal. One thing certainly ought to be done and that is to comply strictly with the laws in every state; and enginemen should be required to familiarize themselves with the statutes in each state in which they may have to run. Sounding the crossing signal twice, instead of once—that is to say, eight blasts instead of four—also would be but a partial remedy for the difficulty. The most direct and rational course would be to enforce with greater care the rules now in effect.

The claim department should show the management just how many crossing accidents have occurred in each state traversed by the company's lines, and this should be followed by checking up the enginemen to see how careful they are. Probably there are enginemen who are satisfied to do the minimum of duty; having blown the whistle to relax their vigilance. A fireman always tells you that he was putting in a fire at the time the accident occurred, so that he did not see anything; but firemen can be educated to take a more lively and human interest. Are your whistles properly tuned to give the best signal; and are you sure that the enginemen do not re-tune them, for reasons of their own? Locomotives might be equipped so that the fireman would have a whistle cord on his side of the cab; and then, in case of emergency, he could sound the whistle instantly.

Finally, the claim department, knowing the causes of accidents at crossings should take care to see that all the lessons from such knowledge are thoroughly impressed on the minds of the officers who are in authority.

*Abstract of a paper read before the Association of Railway Claim Agents at St. Louis, on May 19, 1921.

Edgar E. Clark Resigns from Interstate Commerce Commission

WASHINGTON, D. C.

PRESIDENT HARDING announced on July 22 that he had received the resignation of Chairman Edgar E. Clark as a member of the Interstate Commerce Commission and had appointed to succeed him, Frederick I. Cox, of New Jersey, as a representative of the interests of the commercial travellers. Mr. Clark's letter of resignation was dated July 14 and seems to have been entirely unexpected. It gave as his reason that he had devoted as many years of his life to public service as he felt he could afford. Mr. Clark is to be associated with Wilbur La Roe, Jr., formerly chief examiner of the commission, in practice before the commission, and courts in interstate commerce matters, with office in Washington.

Mr. Clark was the senior member of the commission, having been appointed by President Roosevelt in 1906, had served as chairman during the past year and had recently been re-elected chairman for the new fiscal year ending June 30, 1922, on the motion of Commissioner McChord, who stood next in seniority. Mr. Clark has not been in the best of health for a long time and the duty of representing the commission as chairman has placed upon him an unusual strain during a period when the commission has had before it a task of tremendous magnitude and has been under great pressure of many kinds.

E. E. Clark

Mr. Clark enjoys the distinction of being the only man, in recent years, at least, to resign from the work of the commission to engage in private enterprise. Usually the commissioners have been reappointed upon the expiration of their terms, but some have not been reappointed. Commissioner Lane resigned to become Secretary of the Interior, Commissioner Knapp left it to become a judge of the Commerce Court and Commissioner Prouty resigned to become director of the commission's valuation work. Commissioner Clark's term would not have expired until December 31, 1926.

In the five months since his inauguration, President Harding has now appointed five of the eleven members of the Interstate Commerce Commission. At the end of this year the terms of Commissioners Aitchison and Hall expire so that by that time he will have appointed a majority of the commission. The terms of Commissioners McChord and Eastman expire in 1922.

Mr. Clark was originally appointed as a representative of the labor interests on the commission. He was then president of the Order of Railway Conductors and during the first few years of his connection with the commission he was on several occasions chosen as the representative of labor organizations in wage arbitration proceedings. During recent years, however, he has not been regarded as in any sense a representative of labor and in fact the organizations have made several efforts to obtain direct representation upon the commission. As a practical railroad man and the most experienced in the work of the commission Mr. Clark has been identified with practically all sides of the commission's work and because of his fairness and ability has been generally recognized as its strongest member.

For the past two or three years particularly he has been the chief spokesman of the commission in public. As chairman of its legislative committee Mr. Clark represented the commission in the various hearings before congressional committees while the work of formulating the Transportation Act was in progress and his influence in favor of some of the principal provisions of that act had much to do with commanding an adequate support for them in both houses of Congress.

As chairman of the commission since it was charged with the administration of the new law he has had a tremendous task in trying to translate into a working program the principles laid down in the law, in the face both of wide differences of opinion among some of the commissioners and of the most persistent sort of pressure from interests that were violently opposed to the principle of the act that gave the commission responsibility for the adequacy of the revenues of the carriers as well as for their reasonableness from the point of view of the shipper. He has stood out strongly against a policy of general rate reductions at a time when the President and several members of his cabinet as well as many influential members of Congress were openly urging such a policy. Remembering that the shippers generally a year ago told the commission that they wanted better railroad service and were willing to pay for it he apparently has tried to take them at their word and he has been writing numerous letters to shippers, congressmen and others pointing out that the causes for the business depression lay far deeper than any question of freight rates. His strong stand that rate reductions generally, as distinguished from readjustments in special cases, could not be considered until the railroads had had an opportunity to reduce their cost of operation, has undoubtedly had a potent effect in preventing the administration from being influenced more than it has by the clamor of several large groups of shippers for an immediate reduction of rates.

Chairman Clark has taken an active part in the recent conferences of the government officials on the plan for expediting a settlement of the accounts between the railroads and the government for the period of federal control.

His resignation is to become effective on August 31, or as soon as the appointment of his successor is confirmed.

Mr. Clark was born February 18, 1856, at Lima, New York, and was in railroad service from 1874 to 1889 as a brakeman and conductor. From 1889 to 1890 he was vice-president of the Order of Railway Conductors and from 1890 to 1906 he was president of the order. While in this position he was appointed by President Roosevelt as a member of the Anthracite Coal Strike Commission in 1902. He was ap-

pointed to the Commission, July 7, 1906, to fill one of the two new vacancies created by the Hepburn Act, which increased the membership from five to seven. He was reappointed at the expiration of his term on December 31, 1912, by President Taft, but his confirmation was delayed by the Senate along with other appointments, until after March 4, when he was reappointed by President Wilson. He was then elected chairman of the commission. He was again reappointed in 1919 by President Wilson and on March 8, 1920, he was elected chairman again for the term ending June 30, 1921.

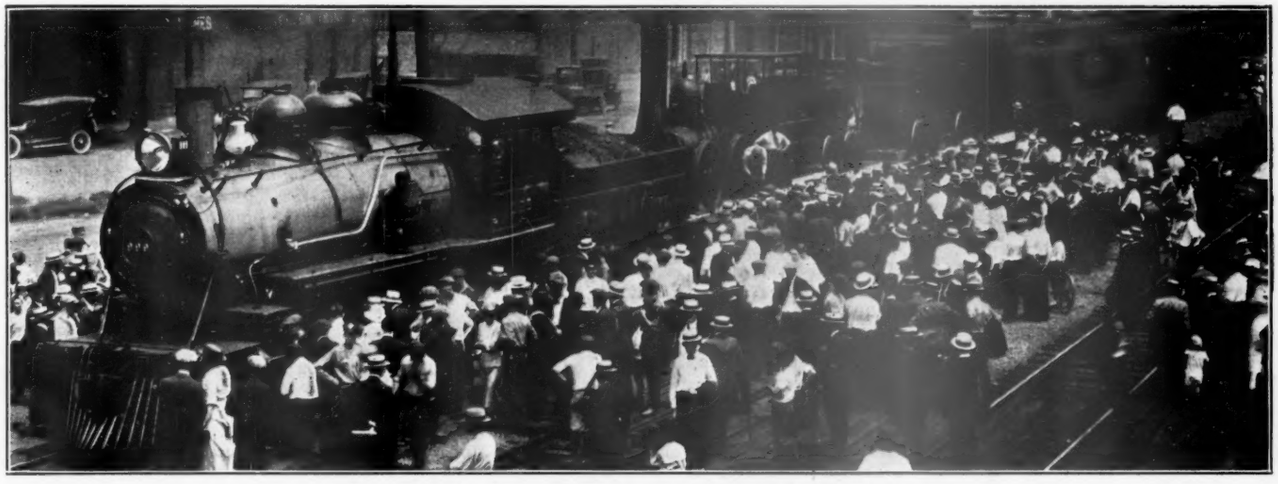
The "DeWitt Clinton" Moves Under Its Own Power

THE LOCOMOTIVE DeWitt Clinton, and its three coaches, the historic New York Central passenger train, which for the past year has been on exhibition in the Grand Central Terminal, New York City, has been taken to Chicago to be exhibited at the "Pageant of Progress" on the Municipal Pier, from July 30 to August 14.

For a short section of this journey the old locomotive was moved under its own power. For the rest of the trip the ancient train was carried on platform cars in a special train drawn by locomotive No. 999, which was one of the notable engines built for the New York Central by William Buchanan, 20 years ago, when the Empire State Express and the Twentieth Century Limited express were first making their reputations. The illustration of this special train on this page is from a photograph taken at Erie, Pa. The 999 has been remodeled, since it was in service on the main line, and during recent years it has hauled passenger trains on the Pennsylvania division. For this special trip the tender was again painted and decorated in the style which was familiar to passengers in 1893.

The first trip made by the DeWitt Clinton with a passenger train was from Albany to Schenectady on August 9, 1831, so that the exhibition at Chicago will mark the ninetieth anniversary of the life of the locomotive. In its present condition the locomotive weighs 9,420 lb. and the tender 5,340 lb. A standard New York Central Pacific type passenger locomotive, now in use, such as that shown in the illustration, weighs 276,000 lb., or about 11 times the weight of the entire train of 1831; though the gage of the track is the same now that it was then.

The DeWitt Clinton continued in active service for 14 years. It made a maximum speed of 30 miles an hour on its first trip; but as fired up for the present exhibition it has been moved at only about eight miles an hour.

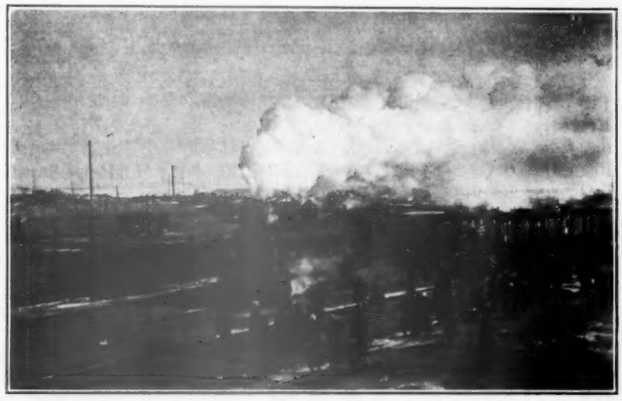


The "999" with the "DeWitt Clinton" at Erie, Pennsylvania

COLONEL B. W. DUNN, chief inspector of the Bureau of Explosives, in commenting on the suggestions for stopping leaks in tank cars, recently made by the Committee on Freight Claim Prevention, Freight Claim Division, A. R. A., stated:

"The proper action in the case of any leakage of inflammable liquid from a tank car is to transfer the contents, unless the leakage can be stopped by manipulation of the outlet valve or tightening of the outlet valve cap. When leaks cannot be stopped in this manner, plugging with oatmeal or other material may be advisable to undertake a short movement of the car, but such measures should not be adopted as a permanent repair, and any approval of the same should be handled in such a way as not to encourage this action except when absolutely necessary.

"The use of oatmeal might be effective where there is a leakage of gasoline through a narrow crack or around the valve seat. Oatmeal may be considered a reasonably good substance, due to the fact that the material is rolled or crushed and not ground into a fine powder. The effectiveness of the method will depend upon the size and shape of the opening. It has also been suggested that plaster of Paris, mixed to a plastic mass, with water, might be rammed down over the point of leakage from inside or outside as may be most convenient. This will set hard in a few minutes."



A Baldwin Decapod Leaving Manchuria, China, for Chita, Siberia

General News Department

An average on-time record of 92 per cent was made by the fast freight service of the Chicago, Indianapolis & Louisville, between Indianapolis, Louisville and Chicago, during the months of May and June.

The number of applications for employment has permitted the Chicago & Alton to restore its age restriction for new employees. No one over 45 years of age or under 21 will be employed hereafter, although during the labor shortage occasioned by the war this rule was waived.

The Railroad Division of the American Society of Mechanical Engineers has elected the following Nominating Committee to present nominations for next year: G. M. Basford, G. M. Basford Company, chairman; W. L. Bean, N. Y., N. H. & H., and Kenneth Rushton, Baldwin Locomotive Works.

The Texas Association of Claim Agents held a three-day session at El Paso, Tex., from July 14 to 17. Approximately 200 members of the association were in attendance at the session, which concentrated on means of relieving heavy claims resulting from live stock losses on railroad right of ways in Texas, Oklahoma, Louisiana and Arkansas.

I. C. C. Decision in New England Divisions Case

The Interstate Commerce Commission in a decision made public Thursday says that it can find no basis afforded for a valid prescription of divisions by it. It decides, however, that fair divisions cannot in many instances flow from the existing arrangements. It expects the roads to work out readjustments and report.

A Correction

In the *Railway Age* of July 2 (page 40), it was incorrectly reported that on the Illinois Central during the month of May, 92.2 per cent of the trains operated were on time, but as shown by the figures given, the percentage of trains on time should have been 99.2 per cent, or 13,451 trains maintaining a scheduled time out of 13,567 operated.

Train Robbery on the Missouri Pacific

Train No. 205 on the Missouri Pacific, running between Memphis, Tenn., and St. Louis, Mo., was held up near Van Dale, Ark., on the night of July 23, and the mail and express cars were looted but it is reported that the robbers made away with but little money. The robbers are said to have been six in number and all armed with rifles. The loot was loaded into an automobile in which the robbers made their escape.

Employers' Associations Ask Permission to Testify Before Labor Board

Telegrams were received by the Railroad Labor Board from the National Association of Manufacturers, the National Erectors' Association and the National Founders' Association on July 26, and the Employers Association of Chicago put in its request on July 27, petitioning the body and seeking to intervene in the Pennsylvania controversy with the shop craft labor union now before the Board. The associations seek to appear for a hearing on behalf of the public and in support of the open shop policy.

Good Work in Freight Offices

J. J. Hooper, general claim agent of the Southern Railway, publishes, in the Southern News Bulletin for July, a list of the names of agents who have 100 per cent records in revising inbound freight billing for some period of time which is not given. Mr. Hooper says that the agents whose names appear—two columns of small type—have made such progress in the work of revising all inbound way bills that they now require only general supervision. Great progress is being made in reducing the number of costly overcharges and undercharges by correct billing and proper care of tariff files.

Unauthorized Strike on the Cincinnati, Indianapolis & Western

Three hundred and two employees of the federated shop crafts of the Cincinnati, Indianapolis & Western shops at Indianapolis walked out on an unauthorized strike on Friday night, July 22. The shop laborers refused to join the strikers and all the foremen remained in service, taking the places of the mechanics. The road began hiring new men Saturday and on the following Wednesday morning had 320 men at work, with applications more than ample to fill all vacancies. A traffic of over 25 per cent above normal has been handled without delay during the strike.

New Grade Crossing Law in Michigan

Representatives of all steam and electric railroads and of county road commissions of the state of Michigan will meet in Lansing, Mich., this week, with the State Public Utilities Commission, to work out the application of the new law, which gives the utilities commission jurisdiction over grade crossings. The new law requires that signs at least 24 in. in diameter be placed 500 to 600 ft. from every crossing, the highway department furnishing the posts and the railroads the signs. This work must be completed by May 18, 1922. The law further requires that all crossings shall be smooth and even and 16 ft. wide for 25 ft. on each side of the crossing.

District Court Issues Decision in Stoker Suit

The suit brought by the Mechanical Construction Company against the Locomotive Stoker Company for infringement of Patent No. 979,849 to William T. Hanna, was tried before Judge Thomson in the District Court of the United States for the Western District of Pennsylvania in February and March, 1921. The defendant denied infringement, alleged the invalidity of the patent, and by way of counterclaim alleged infringement by the plaintiff of Patent No. 1,130,443. The plaintiff in reply denied the validity of this patent or infringement thereof and asked that the counterclaim be dismissed.

The claims of the Hanna patent covered the use of diverging channels in the distributor plates for the distribution of coal in the firebox. In this suit the decision states, "The claims in suit I find valid and infringed." The counterclaim was based on a fuel receptacle below the firing floor, in regard to which the decision states, "I find that for the reason set forth in this opinion, defendant's counter-claim should be dismissed."

The case has been appealed by the Locomotive Stoker Company and it is expected that it will be heard by the Upper Court early in the October term.

Wood Preservers' Association Has Established Service Bureau

The American Wood Preservers' Association is establishing a service bureau to promote the use of treated timber and thereby conserve the forest resources of the country. This bureau will be prepared to furnish information concerning the uses to which treated timber may be applied economically, to answer inquiries regarding the relative durability of treated and untreated woods, and to supply other data concerning the use of timber treated with the standard preservatives, such as zinc chloride and creosote. Headquarters have been established at 10 S. La Salle street, Chicago, and P. R. Hicks, engineer in forest products of the United States Forest Products Laboratory at Madison, Wis., has been appointed secretary-manager.

Tentative Valuations Issued

The Interstate Commerce Commission has issued tentative valuations giving the following figures for the final value:

Kentwood, Greensburg & Southwestern, 1916	$138,834
Gulf Terminal, 1915	565,148
Pine Bluff & Northern, 1916	39,758
Fordyce & Princeton, 1916	174,071
Shreveport Bridge & Terminal, 1915	424,067
Dallas Terminal Railway & Union Depot Co., 1915	1,187,810
Grafton & Upton, 1916	436,785
Conway Electric Street Railway, 1914	151,163
Hoosac Tunnel & Wilmington, 1916	641,864
Pine Bluff & Arkansas River, 1915	153,840
Green Bay & Western, 1916	5,298,582
Kewaunee, Green Bay & Western, 1916	1,289,193
Ahnapee & Western, 1916	676,408
St. Johnsbury & Lake Champlain, 1916	2,924,120
Thornton & Alexandria, 1916	243,542

Wage Reductions in Canada

By a tentative agreement between the Railway Association of Canada and Division 4, Railway Employees Department, American Federation of Labor, the railway employees in the locomotive and car departments, as specified in wage agreement No. 4, will receive a decrease of 8 cents per hour, effective on July 16, 1921. It has also been agreed that promptly upon notice from either the Railway Association of Canada or Division No. 4, Railway Employees Department, American Federation of Labor, to the other, representatives of both will confer further and that except as may be otherwise mutually arranged, any rates and conditions finally agreed upon will be effective as of July 16, 1921. At that time any necessary adjustments will be made accordingly, provided, however, that any such adjustments will not operate to bring about any reclaim from employees of any amount which may have been paid to them pursuant to the terms of the above tentative agreement.

A similar agreement with United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers has resulted in tentative reductions, effective the same date, as follows: all maintenance of way foremen and signal construction foremen, 80 cents per day; carpenters and other skilled workmen, 10 cents per hour; track laborers, crossing watchmen, bridge tenders and others laborers, 8½ cents; signal maintainers, 8 cents; signal helpers and helpers of maintenance mechanics, 7 cents; roundhouse laborers and ash pit men, 10 cents; pumpmen, $17.34 per month; signal men at interlocked crossings, $12.24.

Program for the Roadmasters' Convention

The tentative program for the convention of the Roadmasters' and Maintenance of Way Association, which will be held at the Auditorium Hotel in Chicago on September 20-22 inclusive, has been definitely arranged as follows:

TUESDAY MORNING, SEPTEMBER 20

10:00 a. m. Convention called to order.
Opening business, president's address, etc.

11:00 a. m. Committee report: "The Construction and Maintenance of Railroad Crossings"; D. O. Hearn, roadmaster, Elgin, Joliet & Eastern, Joliet, Ill., chairman.

TUESDAY AFTERNOON

2:00 p. m. Paper: "Results Obtained from the Use of Treated Ties"; J. H. Waterman, superintendent, timber preservation, Chicago, Burlington & Quincy, Galesburg, Ill.

3:00 p. m. Committee report: "The Most Economical Method of Handling and Renewing Cross and Switch Ties"; E. P. Hawkins, division engineer, Missouri Pacific, Wichita, Kan., chairman.

WEDNESDAY MORNING, SEPTEMBER 21

9:30 a. m. Committee report: "Methods of Stimulating Rivalry Among Track Forces"; George T. Koontz, roadmaster, Delaware & Hudson, Carbondale, Pa., chairman.

11:00 a. m. Paper: "The Budget System as Applied to Track Work"; C. A. Morse, chief engineer, Chicago, Rock Island & Pacific, Chicago.

WEDNESDAY AFTERNOON

2:00 p. m. Committee report: "The Classification and Distribution of Second Hand Rail"; L. E. Dale, supervisor, Pennsylvania, Philadelphia, Pa., chairman.

3:00 p. m. Committee report: "The Records and Accounts of a Roadmaster's Office"; F. J. Meyer, assistant engineer, New York, Ontario & Western, Middletown, N. Y., chairman.

6:30 p. m. Annual dinner of the Roadmasters' & Maintenance of Way Association and the Track Supply Association.

THURSDAY MORNING, SEPTEMBER 22

9:30 a. m. Paper: "The String Lining of Curves—Methods and Results"; H. L. Pierce, supervisor, Pennsylvania, Cresson, Pa.

10:15 a. m. Business session, including election of officers, etc.

THURSDAY AFTERNOON

Arrangements are being made for a visit to some interesting operations of value to maintenance men.

Chamber of Commerce Appoints Transportation Committees

The Chamber of Commerce of the United States has appointed two committees to deal with transportation questions during the ensuing year. One is a committee to act for the Chamber's department of transportation and commerce and the other is a special railroad committee.

The members of the regular departmental committee are: Howard Elliott, chairman of the board of directors of the Northern Pacific, chairman; L. B. Stillwell, consulting engineer, New York; E. O. Edgerton, San Francisco; George A. Post, president of the Hudson River Bridge Corporation, New York; W. W. Salmon, president of the General Railway Signal Company, Rochester, New York; H. H. Raymond, New York; J. M. Whitsitt, Charleston, S. C.; A. J. Brosseau, New York; P. H. Gadsen, Philadelphia; D. Fiske, Minneapolis; B. F. Cresson, Jr., New York; J. J. Carty, vice-president of the American Telephone & Telegraph Company, New York; and L. Teter, Chicago.

The members of the special railroad committee are: George A. Post, chairman; T. C. Powell, vice-president of the Erie; H. A. Wheeler, vice-president of the Union Trust Company, Chicago; G. W. Simmons, St. Louis; W. W. Salmon, Rochester; A. W. Smith, general counsel of the Railroad Administration; Emory R. Johnson, Dean of the Wharton School, University of Pennsylvania, Philadelphia; C. E. Lee, East Orange, N. J.; F. C. Dillard, Sherman, Tex.; W. S. Dickey, president of the Kansas City & Missouri River Navigation Company.

The Chamber's transportation department was organized recently with J. R. Bibbins as its manager. The committee will deal with transportation in all its forms and will take up the following subjects:

1. Railroads—Further study of financial resources, consolidation and efficiency, with the object of making them self-sustaining, with adequate service to the public.
2. Marine Transportation, both lake and ocean—The problems of the American merchant marine and proper relation to foreign competition.
3. Terminals and Ports—Intensive study of operating unification to secure a more efficient trans-shipment machine.
4. Electric Railways—The fare situation and ways and means for securing a self-supporting agency of essential public service.
5. Highways—Economic analysis of the problem of highway transport in relation to other agencies, and the proper public subsidy therefor.
6. Waterways—Economic analysis showing the true position of waterways as a natural resource, as yet largely undeveloped.
7. Communications—Encouragement of adequate development for needs of business, especially in connection with foreign countries.
8. Postal and Express—The problem of transportation of the mails upon an economic basis.
9. Air Transport—The codification of laws and regulations to promote safety and encourage aeronautical development with the maximum rapidity.

Traffic News

Freight rates on export grain from points in Illinois to New Orleans, La., were reduced 3 cents per 100 lb. by the Illinois Central on August 11.

New facilities that will permit the icing of two 55-car trains at one time have just been placed in operation at Sparks, Nev., by the Pacific Fruit Express Company. Similar improvements have been made recently at Carlin, Nev., and Ogden, Utah.

The Mississippi section of the government barge line has carried or booked for delivery on downstream barges, this month, 50,000 tons of freight, more than three times the tonnage handled in July, 1920. Over half of the total is grain, which is principally wheat.

The Interstate Commerce Commission has authorized the roads carrying lake coal to extend the 28 cent reduction in the rates on coal transshipped from lower to upper lake ports to apply to Chicago and certain other points not covered in the original tariff.

The Baltimore & Ohio has restored the stop-over privileges on through tickets which were discontinued when the government took control of the railroads in 1919. The list of 31 points at which the stop-over is allowed (ten days) includes the principal cities and summer resorts on the company's lines.

The Chicago, Rock Island & Pacific, the Missouri Pacific, the St. Louis-San Francisco and the Kansas City Southern have agreed to give American Legionnaires attending the third annual convention at Kansas City, Mo., from October 31 to November 2, a special rate of 1 cent a mile.

Representatives of the utilities commissions of 14 states west of the Mississippi river met in Chicago on July 20, to perfect a petition to the Interstate Commerce Commission to reduce rates on hay, grain and grain products 35 per cent, or to the basis in effect prior to August 26, 1920. The commission has set August 15 as the date for hearing arguments for rate readjustments and this case will come up at that time.

Farm Bureau Asks Lower Freight Rates

The American Farm Bureau Federation has prepared a memorial to be sent to the President, members of Congress and the Interstate Commerce Commission asking for a reduction of freight rates on the "basic necessaries of life." The memorial criticizes Section 15-a of the Transportation act as the cause for the high rates and urges its repeal, apparently on the theory that such a step would in some way affect the rate situation.

Georgia Peaches and Melons

Shipments of peaches and watermelons from Georgia this season have surpassed all previous records, disproving the predictions that the crops would rot in the fields because of high freight rates. The Fruit Growers' Express reports that up to July 23, 10,264 cars of peaches had been shipped from Georgia. The total movement for 1920, according to the United States Department of Agriculture, was 5,663 cars. Up to July 17, 10,110 cars of watermelons had been shipped from Georgia, as compared with 5,258 for the same period last year, and 11,103 for the total 1920 movement. Prices received for both peaches and watermelons have yielded the growers good returns.

Favorable weather conditions, improved transportation and icing facilities, and better marketing methods have all contributed to the satisfactory results obtained. The yields of both peaches and watermelons went far ahead of the railways' estimates, but there was an ample supply of refrigerator cars for the peaches and of ventilators for the watermelons. The Atlantic Coal and Ice Corporation was called on to furnish 100,000 tons of ice for the peaches.

The Georgia peach growers, for years, and now the watermelon growers, have co-operative marketing associations which have had a great part in securing the good prices which have been received.

Commission and Court News

Interstate Commerce Commission

The Interstate Commerce Commission, on petition of the Illinois railroads, has ordered an investigation to determine whether the intrastate rates on railroad cross ties in Illinois are discriminatory against interstate commerce.

The commission has issued a decision holding that proposed class rates between points in Kansas and points in Oklahoma; between points in Kansas and Oklahoma and points in Texas; between points in Texas, on the one hand and points in Arkansas and in Louisiana, and Memphis, Vicksburg and Natchez, on the other; and between points in Oklahoma on interstate traffic, filed by the railroads in extension of the Memphis-Southwestern scale, are not justified. The tariffs under suspension were ordered cancelled without prejudice to the filing of tariffs in conformity with the findings of the report.

The Interstate Commerce Commission has rendered a decision on a complaint filed by the Railroad Commissioners of Florida, attacking the line-haul rates and refrigeration charges on citrus fruits and vegetables from Florida producing points to various interstate destinations, in which it is held that the aggregate charges are not unreasonable, except (1) that the line-haul charges on vegetables, except celery, under refrigeration, are unreasonable in that they do not provide in those instances where a lower minimum and higher rate apply than under ventilation for the alternative application of the same rate and minimum as under ventilation, and (2) that the refrigeration charges on fruits and vegetables are unreasonable in that they are based on an excessive quantity of ice. Carriers are directed to revise their tariffs in accordance with the conclusions of the Commission. The rates considered were those in effect prior to the general advance last year.

The Interstate Commerce Commission has rendered its decision on the complaints filed by the National Wholesale Grocers' Association and the Southern Wholesale Grocers' Association in which it finds that the practice of the railroads in permitting the meat packers to load certain articles of groceries in their peddler and branch-house cars is not shown to result in undue prejudice to complainants or unduly to prefer the packers. The various peddler car rates and rules are not shown to be unreasonable or unduly prejudicial, except that the mileage scale of rates applicable on packing house products in peddler cars in southwestern territory are found to be unduly prejudicial to complainants and unduly preferential of the meat packers insofar as it applies on lard substitutes, cottonseed cooking oil, peanut cooking oil, corn cooking oil, soya-bean cooking oil, canned meats, canned soups, chicken tamale, chili con carne, spaghetti-meat chili, and canned meats with vegetable ingredients. Various rules applicable on mixed carloads of fresh meats and packing-house products are found unjust, unreasonable and unduly prejudicial, and reasonable, and uniform mixing rules are prescribed for the future.

Mail Pay Petition Denied

The commission has denied a petition of the railroads for an interpretation of Section 9 of the mail pay order so as to make application of separate compensation for side, terminal and transfer service retroactively to the period November 1, 1916, to March 1, 1920, and for a ruling making application of the minimum annual payment provided in the proviso to Paragraph 2 of Section 3 of the order to the routes as shown in the statement and comprehensive plan of the postmaster general submitted to the commission.

The commission orders, however, that the 25 per cent increase in rates from January 1, 1918, specified in Section 3 of the order be made applicable to the minimum payment of $50 per mile per annum named in the proviso to Section 3 of the order.

State Commissions

The Louisiana Public Service Commission

By the adoption of a new constitution the state of Louisiana has abolished the state railroad commission; and the commissioners, Shelby Taylor, John T. Michel and H. P. Long now constitute the Public Service Commission; and they have authority over all common carriers, street railroads, public utilities, boats and canals, except irrigation canals.

The new commission has issued an order continuing in effect all of the rates and regulations of the former commission until further orders. Street railways and other concerns now being brought under commission regulation for the first time are ordered to publish tariffs and file copies by July 31. The same order gives in brief form the requirements of the law in relation to rates, undue discrimination, etc. The provision allowing free transportation of property for state or municipal governments indicates that this applies only where the said government is "the direct beneficiary" of the reduced rate. No authority for reductions in transportation rates will be granted on account of merely potential water competition.

Personnel of Commissions

Frederick I. Cox, of New Jersey, was on July 22 nominated by the President as a member of the Interstate Commerce Commission in place of Edgar E. Clark, whose resignation takes effect on August 31. Mr. Cox is a silk salesman, for many years connected with Belding Brothers and Company, manufacturers, of New York City, and his appointment is made on the recommendation of the National Council of Traveling Men's Association, endorsed by Senator Frelinghuysen, of New Jersey. This association conducted a campaign in behalf of Mr. Cox last April, when the President made the appointments called for under the law enlarging the Commission. Mr. Cox was born on May 25, 1870, at Rockaway, N. J., and now resides at East Orange, N. J. He has been in mercantile pursuits throughout his business life. His appointment is for a term expiring on December 31, 1926.

F. I. Cox

Court News

Court Approves Reduction of Wages Below Scale Fixed by Labor Board

The federal district court for the Eastern District of Arkansas holds that, in view of the Fifth Amendment to the federal Constitution, a receiver of a railroad, operated before and after his appointment at a continuous loss, the gross earnings being insufficient to pay operating expenses, and where money can no longer be borrowed on the receiver's certificates, may be authorized to reduce the wages of the employees below the scale fixed by the United States Railroad Labor Board in its decision No. 2, which became effective May 1, 1920, without being subject to punishment under section 312 of the Transportation Act. The court holds that to require the railroads to continue in business at a loss is beyond the power of Congress or a state, citing Brooks-Scanlon Co. v. Railroad Commission of Louisiana, 251 U. S. 396, 40 Sup. Ct. 183, 64 L. Ed. 323, reaffirmed in Bullock v. State of Florida, 254 U. S.—St. Louis Union Trust Co. v. Missouri & N. A., 270 Fed. 796.

Foreign Railway News

New Line to Connect French and Italian Railways

The French parliament has just voted $12,400,000, according to the Times (London) Engineering Supplement, to unite the railways of France and Italy by a line from Nice to Cuneo. The Italian part of the line has been in operation for a number of years but of the 36 miles of line in France little has been done but the construction of two important tunnels, one 3¾ miles in length and the other 2½ miles. It is not expected that the line will be completed until some time in 1925.

Tientsin-Pukow Railway Developments

The increase in traffic at the Pukow terminal of the Tientsin-Pukow Railway necessitates the addition of further floating wharves (on the Yangtze river across from Nanking) and the repair of those put in use 10 years ago. About $50,114 will be spent for the entire work, according to Consul John K. Davis. A new power plant is to be erected at Pukow, to be completed in two years. It will supply the city and port with light and power for the Puchen shops, the current to be transmitted to Puchen at 6,600 volts. The maximum power of the plant is stated at 3,000 kilowatts. The cost is estimated to be $237,384.

Belgian Operating and Construction Company Changes Name

The General Light Railway Company of Belgium (Compagnie Générale de Chemins de Fer Secondaires) has announced that henceforth it will be known as the Belgian Railway and Enterprise Company (Compagnie Belge de Chemins de Fer et d'Enterprises). The reason given for the change is that the company in departing more and more from the construction of narrow gage lines and tramways and is devoting itself to standard gage lines and to various construction projects. The old name it was felt was misleading and prejudicial to the best interests of the company.

Spectacular Train Robbery in France

A night express train from Paris bound for Marseilles was, according to a Paris dispatch to the New York *Herald*, held up by bandits on the night of June 24 and the passengers robbed of money and goods valued at approximately $20,000. The robbers, all heavily armed, who boarded the train at a regular stop, began relieving the passengers of their valuables while the train was in motion in the neighborhood of Dijon. When they had finished their work they pulled the bell cord and when the train slowed down left the train for a waiting automobile and made their escape. One passenger was killed and another wounded when they made a show of resistance.

Contract for Chilean Electrification

A newspaper report dated July 20 stated that the directors of the Chilean State Railways had decided to accept the bid of the Westinghouse Electric & Manufacturing Company for the electrification of a section of the state railways.

A later report, issued by the Wall Street Journal, states that the contract which was awarded to the Westinghouse Electric & Manufacturing Company is contingent upon certain financial reservations which have not yet been accepted by that company. The report further states it is understood that the Chilean government has not yet found a means of financing the project, and the inference is that it is a condition of the contract that the company shall assist the government in arranging the financing, or shall accept bonds in payment and thereby be obliged to find a syndicate here or elsewhere to buy those bonds.

The contract involves the electrification of the line between Santiago and Valparaiso and the connection with the Trans-Andine line, from the junction with the Santiago-Valparaiso line, to Los Andes. The work will involve 200 route miles and the contract will amount to between $10,000,000 and $12,000,000.

Equipment and Supplies

Car Orders and Deliveries in June

In presenting in these columns the figures of deliveries of freight cars for domestic service in May, attention was called to the fact that deliveries were "returning to the low level which characterized the first half of 1920." The deliveries in June declined to 2,245—a figure lower than that of any month in 1920 excepting April (when the total was 2,127) and lower than that of any previous month in the current year.

The deliveries of freight cars for foreign service totaled 413, lower than any such total for any month of 1920 or thus far in 1921. Passenger car deliveries for domestic service, on the other hand, increased to 159 for June over the May figure of 138. Indeed the June total is greater than that of any month in 1920 or thus far in 1921.

Freight cars on order and undelivered at the end of June totaled 12,149 for domestic and 3,711 for foreign service—comparing with similar figures of 13,890 and 3,559 for May. Domestic freight cars repaired during June totaled 2,939 as against 3,250 in May. The cars for repair on order and undelivered, however, rose from 12,308 at the end of May to 13,752 at the end of June.

The summary for June, as prepared by the Railway Car Manufacturers Association from the reports of 26 car building companies, follows:

	Domestic	Foreign	Total
New Cars Delivered			
Freight	2,245	413	
Passenger	159	4	
On Order and Undelivered			
Freight	12,149	3,711	15,860
Passenger	291	52	343
Car Repairs			
Delivered—June			2,939
On order and undelivered June 30			13,752

Locomotives

THE NEW YORK CENTRAL and subsidiary lines will receive bids on August 2, for the general repairs of 50 locomotives.

Freight Cars

THE KATANGA RAILWAY (Africa) has placed orders with Belgium car builders for 60 gondola cars.

THE LEHIGH & NEW ENGLAND is having repairs made to 300 box cars at the shops of the Middletown Car Company, Middletown, Pa.

THE RUSSIAN SOVIET GOVERNMENT, according to a dispatch from Montreal, Que., July 19, has given the Canadian Car & Foundry Company, Ltd., a $2,000,000 order for 500, 50-ton tank cars.

THE DELAWARE, LACKAWANNA & WESTERN has given contracts for the repair of box cars to the Magor Car Company for 500, to the Buffalo Steel Car Company 500, and the American Car & Foundry Company 500.

BUFFALO, ROCHESTER & PITTSBURGH reported in the *Railway Age* of July 23, as asking for prices on the repair of from 500 to 1,000 freight cars, will make repairs to a total of 2,000 30-ton wooden box cars. The company has given a contract to the Buffalo Steel Car Company for repairs to 500, 50-ton hopper cars.

THE NEW YORK CENTRAL, reported in the *Railway Age* of July 1, as asking for prices on the repair of 1,000 steel hopper, or gondola cars of 50 tons capacity has given contracts for the repair of freight cars as follows: For the New York Central, 500 box cars to the Ryan Car Company; 500 box cars to Streator Car Company; 500 box cars to Standard Steel Car Company; 500 hopper cars to American Car & Foundry Company, and 500 hopper cars to Buffalo Steel Car Company. For the Pittsburgh & Lake Erie, 500 box cars to Pressed Steel Car Company and 1,000 hopper cars to Standard Steel Car Company. For the Cleveland, Cincinnati, Chicago & St. Louis, 500 general service cars and 500 hopper cars to American Car & Foundry Company. For the Michigan Central, 500 box cars to the Illinois Car & Manufacturing Company, and for the Lake Erie & Western, 500 box cars to Haskell & Barker Car Company.

Iron and Steel

THE MISSOURI PACIFIC is inquiring for two 100-ft. deck turntables weighing 175 tons each.

THE MISSOURI PACIFIC has placed an order with the Lincoln Steel & Forge Company, St. Louis, Mo., for 500 steel underframes.

The MISSISSIPPI CENTRAL is in the market for two 100 ft. second-hand steel bridge spans, designed for Cooper E-40 loading.

THE U. S. GOVERNMENT RIVER TERMINAL at St. Louis, Mo., has let 150 tons of structural material to the St. Louis Structural Steel Company.

MITSUI & COMPANY, New York, has ordered from the United States Steel Products Company, 700 tons of 80-lb. rail and accessories for use on the South Manchuria Railway.

THE CHICAGO & NORTH WESTERN has ordered 1,225 tons of steel from the Morava Construction Company, for use in the reconstruction of the elevator at Irondale, Ill., recently injured in an explosion.

Machinery and Tools

THE CENTRAL OF GEORGIA has ordered a driving wheel lathe and some smaller lathes from the Niles-Bement-Pond Company. The company has also placed an order for car wheel lathes and boring mills.

THE CHICAGO, BURLINGTON & QUINCY will receive bids until 12 o'clock noon, August 5, for machinery for the electrical operation, including the end lift reduction gearing, for the Burlington, Ia., drawbridge.

Miscellaneous

THE CENTRAL OF NEW JERSEY will receive bids until 12 o'clock noon, August 2, for the work of repairing, rebuilding, etc., of its marine equipment, for the period of one year from August 2, 1921, to August 2, 1922.

THE CHICAGO, BURLINGTON & QUINCY will receive bids until 12 o'clock noon, August 5, for 400,000 standard double punched steel tie plates. The company received bids July 29, for 800 spools of galvanized barbed wire fencing, 350 kegs 7-D, 100 kegs 8-D, 49 kegs 16-D, and 85 kegs 20-D cement-coated heavy barbed car nails.

THE NORFOLK & WESTERN will receive bids until 12 o'clock noon, August 10, at Roanoke, Va., for: Parts for electrical apparatus; repairs to electrical apparatus; 75 billets of welding steel; 12,000 lb. spring steel; 110,000 lb. soft steel bars; 80,000 lb. steel shapes and for its requirements of locomotive driving wheel and truck tires for the months of July to September, 1921, both inclusive.

Signaling

THE CHICAGO, BURLINGTON & QUINCY will receive bids until 12 o'clock noon, August 1, at Chicago, Ill., for two 3-track signal bridges.

Trade Publications

STEAM JET ASH CONVEYORS.—The Conveyors Corporation of America, Chicago, has recently issued a booklet entitled "The Proof of the Pudding," which contains reproductions of 70 letters regarding the service obtained with American steam ash conveyors. The list of users who commend this device includes several prominent railroads.

Supply Trade News

M. J. O'Connor has been appointed general sales manager of the **Gary Industrial Paint Company,** with headquarters at 20 East Jackson Boulevard, Chicago.

The Oxweld Acetylene Company, Newark, N. J., has removed the offices of its foreign sales department from Newark to 30 East Forty-second street, New York City.

The **Webster & Perks Tool Company,** Springfield, Ohio, has sold the grinding and polishing stand and accessory department, of its business, to the **Hill-Curtis Co.,** Kalamazoo, Mich.

The **Schaffer Engineering & Equipment Company** announces the combining of its administrative, sales and manufacturing departments in its new general offices at 2828 Smallman street, Pittsburgh, Pa.

The **Sullivan Machinery Company** has moved its Cleveland, Ohio, offices from the Park building to Room 824, Kirby building. The company has also established a new supply depot and service station at Seventh avenue and Thirteenth street, Terre Haute, Ind.

The **Allied Machinery Company of America,** 51 Chambers street, New York City, with offices in all the large countries of the world has been appointed foreign representative in all countries except the United States and Canada for the **Universal Crane Company,** Cleveland, O.

A. M. Castle & Co., Chicago, has started work on the construction of a new steel warehouse at Blackhawk and North Branch streets, Chicago. The building will be 211 ft. by 232 ft. of fireproof construction. The west end of the building for 75 feet is to be two stories in height and the second floor will provide office space 75 ft. by 211 ft. for the general offices of the company.

Charles S. Pflasterer has resigned as assistant manager, railroad sales department of the National Carbon Company, Inc., Cleveland, Ohio, to become railroad sales manager of the **Twin Dry Cell Battery Company,** with office at Cleveland. Mr. Pflasterer was born in Allegheny, Pa., in 1875. After spending two years in the steel mills at Braddock, Pa., he became connected with the Union Switch & Signal Company, Swissvale, Pa., in 1891 as a laborer. In 1893 he entered the employ of the Johnson Railroad Signal Company, Chicago, and from 1894 to 1901 was connected successively with various signal companies, the Chicago & Eastern Illinois, the Cleveland, Cincinnati, Chicago & St. Louis, the Chicago Elevated Railways and the Chicago Great Western. In 1901, he was appointed interlocking foreman on the Union Pacific at Omaha, Neb. From 1901 to 1908, he was successively signal foreman, general signal foreman, superintendent of construction, general signal inspector and assistant signal engineer, and in 1909, was appointed assistant signal engineer of the Oregon Short Line, with headquarters at Ogden, Utah. In 1911, he became connected with the National Carbon Company, Inc., in charge of the caustic soda primary battery department. In October, 1919, he was appointed eastern manager of the railroad sales department at Cleveland and now resigns as assistant manager of the railroad sales department of the National Carbon Company, Inc., to become railroad sales manager of the Twin Dry Cell Battery Company, as above noted.

C. S. Pflasterer

A slack adjuster constructed along new lines applicable to both freight and passenger cars has recently been developed by a Swedish inventor, A. R. Djurson. The Djurson adjuster, which is built for the European market by Actiebolaget Bromsregulator, Stockholm, Sweden, has found extended use on the continent. It is now being introduced in this country and will be handled by the firm of **Hamilton & Hansell, Inc.,** Park Row building, New York.

Sidney G. Johnson, formerly vice-president and director of the General Railway Signal Company, has been made assistant to president of the **Chicago Railway Signal & Supply Company,** Chicago. Mr. Johnson's headquarters are at 30 Church Street, New York City, and he will continue also as sales representative of the Signal Accessories Corporation, Utica, N. Y., and for the Hazard Manufacturing Company, Wilkesbarre, Pa. Mr. Johnson was born in 1874, in Eccles, Lancashire, England. At the age of 12 he came to America and went to Swissvale, where his father, Henry Johnson, was works manager of the Union Switch & Signal Company. About a year later he went to Rahway, N. J., where the Johnson Railroad Signal Company had been established, and during vacations he worked in the shops and drawing office. He attended a preparatory school and for two years after leaving school he worked in the construction gang of the Johnson Railroad Signal Company. He later served with the construction forces of the Union Switch & Signal Company for a year. In 1896, when the Standard Railway Signal Company was organized, with his father as president, he was made signal engineer and had charge of the locking and dog sheets, making estimates, etc. When the company went to Troy he went with it; but, after the Trojan Car Coupler Company's interests took hold, his father left the Standard and he followed him after a few months and went with the Union Switch & Signal Company in 1899, in the New York office. Shortly afterward he was appointed engineer of construction for the eastern district and later was for two years at Swissvale as signal engineer in charge of the estimating department. He then went to New York and had charge of installing the signal system on the Interborough and of other large installations put in at that time. When the Interborough work was finished he was made eastern manager, in charge of sales and construction. About 1910 he was appointed general sales manager, and in March, 1914, became vice-president in charge of sales and engineering. The following July he left the service of the Union Switch & Signal Company to go to the General Railway Signal Company as assistant to the president, and in August 1914, became a vice-president and director of the latter company, from which position he resigned in July, 1920.

S. G. Johnson

E. W. Crellin, president of the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., has retired, effective July 15, and **W. H. Jackson,** secretary and treasurer, has been elected to succeed him at the same time; **P. E. Guibert** and **W. W. Hendrix** have been elected vice-presidents, and **George A. Smith,** secretary and treasurer. **A. C. Pearsall** has been appointed general manager of the Des Moines, Ia., branch, succeeding Mr. Smith, who has gone to Pittsburgh, Pa.

Railway Construction

AMERICAN RAILWAY EXPRESS.—This company has awarded a contract to the St. John Company, Miami, Fla., for the erection of a concrete block express office at Miami, Fla., to cost approximately $15,000. The building will be 50 ft. by 150 ft. and one story in height.

AHUKINI TERMINAL & RAILWAY COMPANY.—The Interstate Commerce Commission has issued a certificate authorizing this company to construct a line in the district of Puna, Island of Kauai, Territory of Hawaii, extending from a point near Anahola Bay to Ahukini Landing on Hanamaulu Bay, approximately 16 miles.

ATCHISON, TOPEKA & SANTA FE.—This company is receiving bids for the construction of an addition to its power plant at Albuquerque, N. M., to cost about $150,000.

CHICAGO, BURLINGTON & QUINCY.—This company has awarded a contract to B. J. Martin, Billings, Mont., for the construction of an addition to its power plant at Sheridan, Wyo.

CHICAGO & NORTH WESTERN.—This company contemplates the construction of a new icing plant at Clinton, Ia., to cost about $50,000.

CHICAGO UNION STATION.—This company, which was noted in the *Railway Age* of July 2 (page 42), as accepting bids for grading the new station site between Madison and Adams streets, has awarded the contract for this work to W. J. Newman & Company, Chicago.

CHICAGO UNION STATION.—This company will shortly accept bids for the construction of the substructure of the Madison street viaduct, Chicago. The company will also shortly accept bids for widening the second link of Canal street, between Jackson and Van Buren streets.

ILLINOIS CENTRAL.—This company has awarded the contract for a new brick passenger station at Speedway, Ill., with dimensions of 22 ft. by 60 ft., to Ellington-Miller, Chicago.

ILLINOIS CENTRAL.—This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a switchmen's office and general yard office at Clinton, Ill., to cost about $25,000.

MISSOURI PACIFIC.—This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for improvements to the terminal facilities at Hoisington, Kan., including the installation of a new 100 ft. turntable and an extension to its yards.

SEABOARD AIR LINE.—This company has awarded a contract to the Elliott Building Company, Hickory, N. C., for the erection of a brick station with necessary sheds, platforms, etc., at Chester, S. C.

ST. LOUIS-SAN FRANCISCO.—This company contemplates the construction of a new freight and passenger station at Fayetteville, Ark., to cost about $70,000.

A Paid Technical Course Offered To High School Graduates

TECHNICAL TRAINING, six hours a week, is offered by the Western Electric Company, in a special free course, to a limited number of its employees who are this year's high school graduates. These young men will be developed for positions of responsibility in the laboratories and drafting divisions of the company's engineering department. The new course is divided into three units, each requiring a year for completion. It covers the fundamental principles of physics and mathematics and their use in the field of telephony. The instruction will be given on company time within the regular hours of employment, but the students will be required to do considerable study and preparation at home. The salaries of the young men will be readjusted twice a year and will be based upon their records in the classroom and their proficiency in their duties. The only expense will be that for the purchase of standard textbooks.

Railway Financial News

AMERICUS & ATLANTIC.—*Asks Authority to Issue Securities.*—This company has applied to the Interstate Commerce Commission for authority to issue $150,000 of capital stock and $120,000 or 50-year 6 per cent bonds. It is proposed to use $115,750 of the proceeds of the stock to purchase a railroad, extending for 15 miles from Mata, Ga., which it is proposed later to extend to Americus, Ga.

BOSTON & MAINE.—*Authorized to Abandon Branch Line.*—The Interstate Commerce Commission has issued certificates authorizing the abandonment of a branch line from Bethlehem Junction to Profile House, Grafton county, New Hampshire, about 9 miles, and another branch from Cherry Mountain to Jefferson, N. H., 3.5 miles. The certificate was asked on the ground that the competition of automobiles had reduced the traffic to practically nothing.

CHESAPEAKE & OHIO.—*Authorized to Issue Bonds.*—This company has been authorized by the Interstate Commerce Commission to nominally issue $8,539,238 of first lien and improvement 20-year bonds in respect of expenditures made for refunding and construction and to pledge $6,674,000 of the bonds as collateral for a loan from the United States.

CHICAGO, ROCK ISLAND & PACIFIC.—*Asks Authority to Pledge Bonds.*—Application has been filed with the Interstate Commerce Commission for authority to pledge $8,364,000 of first and refunding mortgage gold bonds as security for short term loans.

DELAWARE, LACKAWANNA & WESTERN.—*Stock Increase and Segregation of Coal Properties Approved.*—The stockholders on July 21 approved the increase of $45,000,000 in the company's capital stock, as was authorized by the Interstate Commerce Commission in its decision outlined in the *Railway Age*, issue of April 22, 1921, page 995. Approval was also given to the plan for segregating the coal properties by their sale to the Glen Alden Company, for $60,000,000 of the latter's 4 per cent bonds and notes. See *Railway Age*, issue of May 20, 1921, page 1192.

The contract for the sale of the coal properties calls on the Glen Alden Company to establish a sinking fund of $1,500,000 annually, beginning September 1, 1926, to be continued until the $60,000,000 shall have been paid. It is provided further that should the Glen Alden Company mine more than 12,000,000 tons of coal in any year, the sinking fund must be increased to $2,000,000.

The Glen Alden stock will be offered to the Lackawanna shareholders at $5 per share, on a share for share basis. This privilege goes to stockholders on record June 15. Payment of the shares must be made on or before August 20.

The Delaware, Lackawanna & Western Coal Sales Company will not be disposed of, but will act as the sales agent for the Glen Alden, which will confine its work to mining.

DENVER & RIO GRANDE.—*Formal Transfer Authorized.*—The formal transfer of this road, sold at foreclosure November 20 to the Western Pacific, was authorized by Federal Judges Lewis and Sanborn on July 27 in an order approving and affirming the final report of William A. Jackson, special master. An appeal from the decision of Judge Lewis against the stockholders in their fraud suit is still pending, but Judge Lewis has announced that this will not interfere with the transfer.

F. C. Schramm, president of the Salt Lake Commercial Club, has sent a letter to Senator Reed Smoot of Utah, urging him to see the Interstate Commerce Commission in an effort to get an immediate decision on the Denver & Rio Grande situation. The letter states that the delay is having an adverse effect on business interests in Utah and other western states.

EL PASO & SOUTHWESTERN.—*Authorized to Issue Stock of No Par Value.*—This company has been authorized by the Interstate Commerce Commission to issue 750,000 shares of capital stock without par value in exchange for and in retirement of all its capital stock now outstanding, which consists of 250,000 shares of an aggregate par value of $25,000,000. Commissioner Eastman dissented.

GREAT NORTHERN.—*Asks Loan from Revolving Fund.*—This company has applied to the Interstate Commerce Commission for a loan of $15,000,000 for five years from the revolving fund with which to repay a loan for a like amount which matures on

September 1. The application explains that the company has made a final settlement with the director general of railroads and has received partial payments on account of its six months' guaranty, amounting to $12,500,000. In making its settlement the director general set off $16,997,642, due to the government for additions and betterments, against the amounts due the company for the period of federal control, and denied the request that the additions and betterments be funded, but the company has been assured that if the policy be changed as proposed and funds are put at the disposal of the director general, he will refund, in whole or part, the amount of the additions and betterments, which would enable the company to repay the loan from the revolving fund. The loan is asked for five years, but it is proposed that not exceeding $10,000,000 of the amount shall become due and payable when funds are received from the director general. The company offers to deposit as collateral security for this loan, and $2,910,000 of other loans, $22,500,000 of general mortgage 7 per cent bonds.

HUNTINGDON & BROAD TOP MOUNTAIN.—*Authorized to Assume Liability.*—The Interstate Commerce Commission has authorized this company to assume liability in respect of $300,000 of equipment trust 6 per cent certificates in connection with the procurement of four locomotives and 10 passenger cars.

KENTWOOD, GREENSBURG & SOUTHWESTERN.—*Authorized to Abandon Line.*—The Interstate Commerce Commission has issued a certificate authorizing this company to abandon its line, extending from Kent's Mill to Freiler, La., 13.21 miles.

KINDER & NORTHWESTERN.—*Authorized to Abandon Line.*—The Interstate Commerce Commission has issued a certificate authorizing the abandonment of a portion of its line from Kinder to Bullard, La., 16 miles.

LEHIGH VALLEY.—*Another Extension Granted.*—Judge Learned Hand in the United States District Court at New York has granted this company another extension of time for 30 days, or until August 23, to present a plan for segregating its properties.

LITTLE ROCK, MAUMELLE & WESTERN.—*Dismantled.*—The right-of-way, ties, rails and equipment of this company, which runs between Becker, Ark., and Cold Springs, 25 miles, and was originally planned to be extended to Hot Springs, will be sold and junked.

LONG FORK.—*Asks Authority to Issue Securities.*—This company has applied to the Interstate Commerce Commission for authority to issue $485,000 of capital stock and $1,347,500 first mortgage 6 per cent bonds to be disposed of to the Baltimore & Ohio in settlement of advances.

LOUISVILLE & NASHVILLE.—*To Increase Capital Stock.*—The stockholders at a special meeting in Louisville, Ky., on July 23, authorized an increase of $53,000,000 in the company's capital stock and authorized the board to apply to the Interstate Commerce Commission for permission to distribute proceeds of the new issue as a stock dividend. See *Railway Age*, issue of June 24, 1921, page 1472.

Steps also were taken to execute a blanket mortgage upon the company's property as security for first mortgage and refunding gold bonds to fund as much as may be deemed necessary of the debt of the road, which on December 31 last was $166,300,825.

MISSOURI & NORTH ARKANSAS.—*New Receiver.—Road to Discontinue Operation.*—J. C. Murray, who has been appointed receiver and general manager to succeed C. A. Phelan, resigned, has announced that passenger service will be stopped July 31. Mr. Murray says that interference by strikers is the main cause. The citizens of Eureka Springs, Ark., are organizing a company to lease the track and equipment of the Missouri & North Arkansas and have applied to the court for permission to operate the line.

The Missouri & North Arkansas operates between Joplin, Mo., and Helena, Ark., 368 miles. The road has stocks and bonds outstanding of $16,680,000, all of which are pledged under $6,000,000 notes of the Allegheny Improvement Company. There are also approximately $2,000,000 receivers' certificates outstanding.

See also article on another page of this issue entitled "Missouri & North Arkansas Discontinues Operation."

MISSOURI PACIFIC.—*Authorized to Issue Bonds.*—This company has been authorized by the Interstate Commerce Commission to issue from time to time $5,501,500 of first and refunding mortgage bonds to be sold at not less than 90 or pledged as collateral for short term notes.

READING COMPANY.—*Supersedeas Bond Filed.*—The $750,000 supersedeas bond of the Continental Insurance Company and the Fidelity-Phoenix Fire Insurance Company of New York, required for an appeal to the United States Supreme Court from the decision of the United States District Court in the Reading segregation plan, that common and preferred stockholders shall share equally in the distribution of the stock of the new company, was filed in the District Court at Philadelphia on July 21. The bond was required to protect the preferred stockholders and others from any financial loss through the appeal.

ST. LOUIS-SAN FRANCISCO.—*Annual Report.*—A review of this company's annual report for 1920 appears on another page of this issue.

ST. LOUIS SOUTHWESTERN.—*Annual Report.*—The corporate income account for the year ended December 31, 1920, compares with the previous year, as follows:

	1920	1919
Tentative standard return* (January 1 to February 29, 1920; full year 1919)	$651,819	$3,910,914
Ten months, March 1 to December 31:*		
Railway operating revenues	25,994,911	.....
Railway operating expenses	20,974,095	.....
Net revenue from railway operations	5,020,816	.....
Railway tax accruals	1,049,355	.....
Railway operating income	3,970,947	.....
Total non-operating income	1,534,298	659,740
Gross income	6,105,478	4,570,653
Interest on funded debt	2,236,888	2,250,490
Total deductions from gross income	3,145,642	3,224,744
Net income	2,959,837	1,345,909
Income appropriated for investment in physical property	2,959,837	.....
Income balance transferred to profit and loss	.....	1,345,909

*The St. Louis Southwestern did not accept the U. S. Government guaranty.

The annual report of the St. Louis Southwestern will be reviewed editorially in an early issue.

SOUTHERN.—*Question of Eligibility to Guaranty to Be Considered.*—The Interstate Commerce Commission has announced a hearing at Washington on August 3 before Director Colston of the Bureau of Finance on a question as to the construction of section 209 of the Transportation act, providing for the six months guaranty, in its application to carriers under common control and management, and particularly regarding the right of subsidiary or controlled companies of the Southern Railway to claim benefits under the guaranty section. The Southern did not file with the commission a written statement accepting the provisions of the guaranty section but its various subsidiaries did. The commission's notice says that evidence may be presented bearing upon the corporate, financial and operating relationships between the Southern and the various subsidiaries.

Guaranty Certificates Issued

The Interstate Commerce Commission has issued certificates for partial payments on account of the six months' guaranty to the following roads: Terminal Railroad Association of St. Louis, $30,000; Arizona & New Mexico, $150,000.

Railroad Administration Settlements

The United States Railroad Administration reports the following final settlements, and has paid out to the several roads the following amounts: Missouri Pacific, $9,000,000; Alton & Southern, $385,000; Trans-Mississippi Terminal, $55,000; Chattanooga Station Company, $19,623.81; Gulf Terminal, $9,426.33. The payment of these claims on final settlement is largely made up of balance of compensation due, but includes all other disputed items as between the railroad companies and the Administration during the 26 months of federal control.

Dividends Declared

Delaware & Hudson.—2¼ per cent, quarterly, payable September 20 to holders of record August 27.

Pennsylvania.—$0.50, quarterly, payable August 31 to holders of record August 1.

Pullman Company.—$2, quarterly, payable August 15 to holders of record July 30.

Annual Report

Report of St. Louis-San Francisco Railway Company

TO THE STOCKHOLDERS:

Your Directors submit report for the year ended December 31, 1920.

During the two months ended February 29, 1920, the property of the Company was within the control of and operated by the United States Railroad Administration. At midnight, February 29, 1920, corporate operation of the property was resumed and in due season the Company accepted the guaranty provisions of Section 209 of the Transportation Act.

The primary basis of the guaranty provided by the Transportation Act is one-half of the average annual railway operating income (Standard Return) of the Company's lines (including affiliated companies) for the three years ended June 30, 1917, as finally certified by the Interstate Commerce Commission as compensation to be paid the Company for the use of its property during Federal Control.

In your Directors' report for the year ended December 31, 1919, you were advised of the amount of such compensation which at that time had been tentatively certified by the Commission and that final certification was being deferred pending the decision of certain questions of accounting. These questions have since been decided with the result that the Commission has finally certified as due the Company and its affiliated companies, annual compensation in the amount of $13,632,917.19, in lieu of the amount of $13,423,400.27, allowed in its tentative certificates, an increase of $209,516.92 in the annual basis of compensation for both the Federal Control and Guaranty periods.

The Company's gross income for the year ended December 31, 1920, as set forth in the statement of Income Account submitted herewith, includes, for the months of January and February, 1920, a proper proportion of the annual Standard Return as finally certified by the Interstate Commerce Commission; a six-months' proportion of similar annual Standard Return guaranteed under the Transportation Act for the six months ended August 31, 1920; the difference covering the period from January 1, 1918, to December 31, 1919, between the tentatively certified Standard Return previously taken into account and the Standard Return as finally certified; increased compensation on account of equipment acquired and addition and betterments made to the Company's properties during Federal Control and the Guaranty period; and the net operating income from corporate operation of the properties for the four months ended December 31, 1920.

No settlement has as yet been made with the Director General of Railroads for maintenance of the property during Federal Control, nor for any other matters growing out of the operation of the property by the United States Railroad Administration. Settlement has not yet been effected with the Interstate Commerce Commission under the terms of the guaranty provisions of the Transportation Act. On January 13, 1921, an advance of $1,000,000 was received from the United States Railroad Administration, and on March 24, 1921, an advance of $1,353,000 was received on account of the guaranty period on certificates issued by the Interstate Commerce Commission. The President is actively engaged in endeavoring to secure final settlement and cash reimbursement from the United States Government on account of the claims filed by the Company, including its affiliated and subsidiary companies for both the Federal Control and Guaranty periods. Negotiations to that end are proceeding currently.

SECURITIES ISSUED, SOLD OR PLEDGED

During the year, the Company issued to the Director General, as stated in its last annual report, $14,029,500, principal amount, equipment notes, dated January 15, 1920, bearing interest at the rate of six per cent per annum, payable semi-annually, and maturing serially from January 15, 1921, to January 15, 1935, inclusive. These notes were issued at par in payment of the cost, as tentatively certified at the time of such issue, of the following equipment purchased from the United States Railroad Administration:

33 Light Mikado locomotives.
7 Light Switcher locomotives.
3500 Double Sheathed 40 ton box cars.
1000 Composite 50 ton gondola cars.

No stocks, bonds or other securities of the Company or of any controlled or subsidiary company of the system have, during the period covered by this report, been sold or pledged by the Company or by any of its respective controlled or subsidiary companies.

EQUIPMENT

In addition to the purchase of equipment set forth in the last Annual Report, the Company has also purchased from the War Department ten (10) additional decapod type locomotives (originally built for the Russian Government) at a total cost of $250,000—$25,000 payable in cash and the balance in nine annual installments of $25,000 each, beginning November 1, 1921; the deferred payments to bear interest at the rate of six per cent per annum.

DOUBLE TRACK

During the year the Company has had under construction a considerable amount of additional main track in order to provide stretches of double track for more economical operation in heavy traffic territory, having completed and placed in service during the period covered by this report 6.67 miles, and had under construction 24.2 miles additional, of which 16.5 miles were completed and placed in service during the early part of 1921 and the remaining 7.7 miles it is expected will be completed and placed in service shortly. When all of the new construction has been placed in service the Company will have 89.72 miles of double track in main line service.

At the time of Reorganization, and the preparation of the Adjustment Mortgage, and the Income Mortgage of the Company, the fiscal year for the making of the Annual reports to the Interstate Commerce Commission ended June 30. The same fiscal year was adopted in both the Adjustment Mortgage and the Income Mortgage.

This has since been changed by the Interstate Commerce Commission so that the period for making the Annual Reports is now the calendar year instead of the year ending June 30, and as a consequence the Annual Report filed with the Commission does not show income for the fiscal year ending June 30.

INCOME ACCOUNT FOR YEAR ENDED JUNE 30, 1920

The following statement shows the corporate income for the fiscal year ended June 30, 1920, as certified by Messrs. Deloitte, Plender, Griffiths & Company, Certified Public Accountants.

Eight Months' proportion of Tentative Annual Standard Return, as certified by the Interstate Commerce Commission	$8,993,143.16	
Increased Compensation on account of allocated Equipment, January 15 to March 1, 1920	109,391.60	$9,102,534.76
Four months' proportion of Guaranty under Transportation Act 1920, based on Tentative Standard Return	$4,471,836.77	
Increased Compensation on account of Equipment allocated and purchased and Additions and Betterments (net) completed at March 1, 1920	367,188.50	4,839,025.27
		$13,941,560.03

STATEMENT OF INCOME ACCOUNT

YEAR ENDED DECEMBER 31ST, 1920

	Six Months Ended June 30, 1920	Six Months Ended Dec. 30, 1920	Twelve Months Ended December 31, 1920	
Two months (Jan. 1st—Feb. 29th), proportion of Annual Standard Return as finally certified by the Interstate Commerce Commission	$2,235,918.44	$34,919.45	$2,270,837.89	
Six months (March 1st—Aug. 31st), Guarantee under the Transportation Act, 1920, based on Standard Return as finally certified by the Interstate Commerce Commission	4,471,836.77	2,340,676.90	6,812,513.67	
Increased Compensation on account of equipment allocated and purchased and additions and betterments (Net) completed at March 1st, 1920, and during Guaranty Period	476,586.10	229,104.61	705,684.71	
Difference between Tentative Standard Return taken into account and Standard Return as finally certified January 1st, 1918—December 31st, 1919		419,033.84	419,033.84	
Net Operating Income September 1st—December 31st, 1920. (Less corporate expenses for months of January and February, 1920, Column 1.) For detail see page 15	*51,719.14*	5,588,236.57	5,536,517.43	
	$7,132,616.17	$8,611,971.37		$15,744,587.54
Other Income:				
Rentals	$58,371.75	$183,463.91	$241,835.66	
Interest	175,091.75	7,426.77	182,518.52	
Miscellaneous income	12,506.18	160,637.86	173,144.04	
Total Other Income	$245,969.68	$351,528.54		$597,498.22
Gross Income	$7,378,585.85	$8,963,499.91		$16,342,085.76
Deductions from Income:				
Rentals	$109,722.14	$109,897.12	$219,619.26	
Taxes	99,741.70	80,882.63	180,624.33	
Miscellaneous Income Charges	6,093.33	9,695.38	15,788.71	
Deficit of Frisco Refrigerator Line	48,990.16		48,990.16	
Sinking Funds	26,652.42	24,005.32	50,657.74	
Total Deductions from Income	$291,199.75	$224,480.45		$515,680.20
Balance Available for Interest, etc	$7,087,386.10	$8,739,019.46		$15,826,405.56
Interest on Fixed Charge Obligations	4,804,787.73	4,825,973.44		9,630,761.17
Balance	$2,282,598.37	$3,913,046.02		$6,195,644.39
Interest on Cumulative Adjustment Bonds	1,164,278.03	1,176,615.55		2,340,893.58
Balance	$1,118,320.34	$2,736,430.47		$3,854,750.81
Interest on Income Bonds	1,055,760.00	1,055,760.00		2,111,520.00
Balance	$62,560.34	$1,680,670.47		$1,743,230.81

Figures in italics denote debit.

Note—The transactions of the Kansas City, Clinton & Springfield Railway Company, which Company is operated separately, are not included in the above, but the amounts advanced by the Kansas City, Fort Scott & Memphis Railway Company to meet the interest of the Kansas City, Clinton & Springfield Railway Company Bonds have been charged against Income.

Other Income:		
Rentals	$93,228.08	
Interest	131,404.75	
Interest (estimated) due by Director General on Net Current Balance from January 1, 1918, to June 30, 1920	364,123.30	
Miscellaneous Income	25,443.83	614,199.96
		$14,555,759.99
Deductions from Income:		
Expenses of Corporate Organization	$174,808.63	
Taxes	204,085.73	
Rentals	232,854.84	
Miscellaneous Income Charges	18,020.95	
Sinking Funds	53,258.74	
Deficit of Frisco Refrigerator Line	91,511.79	
		774,540.68
Balance available for Interest, etc.		$13,781,219.31
Interest on Fixed Charge Obligations		9,268,326.12
Balance available for Interest on Cumulative Adjustment Bonds		$4,512,893.19
Interest on Cumulative Adjustment Bonds		2,328,007.82
Balance available for Interest on Income Bonds		$2,184,885.37
Interest on Income Bonds		2,111,520.00
Surplus transferred to Profit and Loss Account		$73,365.37

Insofar as the statements embraced in the report cover the period of Federal operation, the data therefor were taken from the Federal Manager's records and included with the similar data with respect to Corporate operation during the year, for purposes of comparison and continuity of record.

By order of the Board of Directors,

May 5, 1921. E. N. BROWN, Chairman.
J. M. KURN, President.

STATEMENT OF COMBINED GENERAL PROFIT AND LOSS ACCOUNT AND ADJUSTMENTS THEREIN
YEAR ENDED DECEMBER 31ST, 1920

Credit.		
Balance at credit, January 1st, 1920		$1,272,475.18
Balance of income account for year to date	$1,743,230.81	
Donations, account industrial tracks (see contra)	200,245.88	
Miscellaneous adjustments (net)	35,987.01	1,979,463.70
		$3,251,938.88

Debit.		
Surplus appropriated for investment in physical property (see contra)	$200,245.88	
Debt discount extinguished through surplus	28,141.81	$228,387.69
BALANCE AT CREDIT, DECEMBER 31st, 1920		$3,023,551.19

STATEMENT OF CONDENSED GENERAL BALANCE SHEET AS AT DECEMBER 31ST, 1920.

ASSETS			LIABILITIES		
Investments—			*Stock—*		
Investment in road and equipment:			Capital stock:		
Road	$294,658,770.82		(a) Common stock	$50,447,026.00	
Equipment	65,652,518.49	$360,311,289.31	(b) Preferred stock	7,500,000.00	
Sinking funds:			Total capital stock		$57,947,026.00
Total book assets $783,578.80			*Long term debt—*		
Issues of the railway at par. 780,000.00			Funded debt unmatured:		
Cash		3,578.80	(a) Equipment trust obligations	$15,373,500.00	
Deposits in lieu of mortgaged property sold		34,440.44	(b) Mortgage bonds:		
Miscellaneous physical property		1,126,136.88	Book liability $186,982,240.00		
Investments in affiliated companies:			Held by or for the railway 5,322,195.00		
(a) Stock (pledged)	$202,334.33		Actually outstanding	181,660,045.00	
(c) Notes	96,411.43		(c) Collateral trust bonds and certificates	5,384,700.00	
(d) Advances	10,189.00	308,934.76	(d) Income bonds	80,135,923.00	
Other investments:			(e) Miscellaneous	386,507.96	
(a) Stock	$1.00		Total long term debt		282,940,675.96
(b) Bonds—Liberty Bonds at par	402,850.00		*Current liabilities—*		
(c) Notes	79,844.39		Loans and bills payable	$10,000.00	
(d) Advances	29,508.18	512,203.57	Traffic and car service balances payable	1,148,438.92	
Total investments		$362,296,583.76	Audited accounts and wages payable	13,565,693.68	
Current assets—			Miscellaneous accounts payable	817,906.77	
Cash	$6,962,536.35		Interest matured unpaid	4,054,756.41	
Special deposits	688,675.79		Funded debt matured unpaid	35,675.00	
Loans and bills receivable	143,416.07		Unmatured interest accrued	3,304,857.72	
Traffic and car service balances receivable	1,398,242.59		Unmatured rents accrued	14,020.84	
Net balance receivable from agents and conductors	991,585.06		Total current liabilities		22,951,349.34
Miscellaneous accounts receivable	3,739,833.17		Deferred liabilities—		
Material and supplies	10,208,290.95		Other deferred liabilities		205,967.91
Interest and dividends receivable	5,371.42		*Unadjusted credits—*		
Rents receivable	2,513.74		Tax liability	$1,516,493.93	
Other current assets	240,305.98		Insurance reserve	227,513.43	
Net balance due from United States Government	6,691,299.61		Operating reserve	541,355.17	
Total current assets		31,072,070.73	Operating reserve—Guaranty Period	2,036,499.01	
Deferred assets—			Accrued depreciation—road	407,086.20	
Working fund advances	$64,101.56		Accrued depreciation—equipment	20,064,281.12	
Insurance fund:			Other unadjusted credits	3,836,960.95	
Total book assets $227,513.43			Total unadjusted credits		28,630,189.81
Issues of the railway at par 140,000.00			*Corporate surplus—*		
Cash	87,513.43		Additions to property through income and surplus	591,189.89	
Other deferred assets	91,347.08		Funded debt retired through income and surplus	541,000.00	
Total deferred assets		242,962.07	Sinking fund reserve	783,578.80	
Unadjusted debits—			Profit and loss—balance	3,023,551.19	
Rents and insurance paid in advance	$74,989.73		Total corporate surplus		4,939,319.88
Other unadjusted debits	3,927,922.61				
Securities issued or assumed —Unpledged $4,402,195.00					
Total unadjusted debits		4,002,912.34			
		$397,614,528.90			$397,614,528.90

NOTE—The transactions of the Kansas City, Clinton & Springfield Railway Company, which Company is operated separately, are not included in the above, but the amounts advanced by the Kansas City, Fort Scott & Memphis Railway Company to meet the interest on the Kansas City, Clinton & Springfield Railway Company Bonds have been charged against Income.

SUMMARY OF FREIGHT TRAFFIC, FOR THE TEN YEARS ENDED JUNE 30, 1916, AND THE FIVE YEARS ENDED DECEMBER 31, 1920
REVENUE FREIGHT

Years, ended June 30	Average mileage operated	Tons carried			Average per ton		Average load in tons	
		Number	Mileage	Revenue	Miles carried	Rate per mile cents	Per train	Per loaded car
1907	5,061.72	16,154,154	2,658,150,453	$26,848,664.91	164.55	1.00	224.44	16.90
1908	5,064.16	15,275,619	2,465,448,295	23,976,296.87	161.40	0.97	212.30	17.13
1909	5,072.67	15,952,144	2,518,944,746	25,262,515.93	157.91	1.00	220.81	16.93
1910	5,071.79	17,829,713	2,829,482,793	27,645,863.48	158.69	0.98	222.91	17.14
1911	5,187.93	17,128,446	2,675,695,200	28,071,781.86	156.21	1.05	220.93	15.98
1912	5,241.39	16,985,882	2,714,876,424	27,505,797.98	159.83	1.01	255.19	16.15
1913	5,254.98	19,739,790	3,126,717,306	31,272,806.96	158.40	1.00	281.44	17.13
1914	5,259.09	19,906,151	3,027,900,826	30,202,499.08	152.11	1.00	297.47	17.80
1915	5,252.07	18,762,319	3,100,939,639	29,485,596.48	165.27	0.95	330.09	19.26
1916	5,254.97	20,459,901	3,452,384,669	33,547,466.45	168.73	0.97	333.95	19.31
Years ended Dec. 31								
1916	5,256.09	21,270,024	3,697,396,315	36,555,443.72	173.83	0.99	337.07	19.24
1917	5,207.03	23,011,162	3,963,259,492	39,421,537.80	172.23	0.99	381.55	21.58
1908	5,165.50	22,998,106	4,155,542,672	47,161,817.72	180.69	1.13	391.59	23.45
1919	5,252.37	21,439,266	4,036,818,931	53,558,494.45	188.29	1.33	379.83	21.77
1920	5,252.68	24,718,345	4,621,380,827	66,338,921.56	186.96	1.44	398.34	23.44

[ADVERTISEMENT]

Railway Officers

Executive

Robert J. Marony, assistant secretary and assistant treasurer of the Chicago, Milwaukee & St. Paul, with headquarters at New York, has been elected vice-president, succeeding G. G. Mason, who has resigned. Mr. Marony was born in 1881, at Philadelphia, Pa. He was educated at the public schools of New York City and the College of the City of New York, which institution he attended two years. In 1905 he entered the employ of the Chicago, Milwaukee & St. Paul, as a clerk in the company's financial offices at New York and subsequently served in various positions in the company's financial and executive offices in New York. In 1912, he was elected assistant secretary and assistant treasurer, in which position he was serving at the time of his recent election. Mr. Marony will continue to serve as assistant secretary and assistant treasurer in addition to his new duties.

R. J. Marony

Financial, Legal and Accounting

C. Leber has been elected secretary of the Peoria & Pekin Union, succeeding R. H. Hardin, resigned, effective July 15. Mr. Leber has also been appointed auditor succeeding Mr. Hardin.

Operating

L. R. Taylor, superintendent of telegraph and signals of the Virginian having resigned, effective July 1, the position has been abolished and employees formerly reporting to Mr. Taylor will henceforth report to the general manager.

W. A. Gore, superintendent of the New River division of the Virginian with headquarters at Princeton, W. Va., has been appointed general manager, with jurisdiction over the transportation and maintenance of way departments, with headquarters at Norfolk, Va., effective July 1. **J. W. White** succeeds Mr. Gore as superintendent at Princeton.

General

Appointments on the Los Angeles & Salt Lake

Coincident with the purchase of the Los Angeles & Salt Lake by the Union Pacific the officers of the latter company will also serve the Los Angeles & Salt Lake as follows:

Name	Position	Headquarters
Robert S. Lovett	Chairman executive committee	New York.
Carl R. Gray	President	Omaha.
E. E. Adams	First vice-president	Omaha.
H. M. Adams	Second vice-president	Omaha.
Thomas Price	Secretary	New York.
E. M. Kindler	Assistant secretary	New York.
C. B. Matthai	Assistant secretary	Omaha.
E. G. Smith	Treasurer	New York.
T. C. Richards	Assistant treasurer	New York.
H. W. Clark	General counsel	New York.
F. W. Charske	Comptroller	New York.
H. S. Bradt	Assistant Comptroller	New York.
G. E. Bissonnet	General auditor	Omaha.
H. A. Scandrett	Valuation and commerce counsel	Omaha.
F. W. Robinson	Freight traffic manager	Omaha.
W. S. Bassinger	Passenger traffic manager	Omaha.
R. R. Mitchell	Assistant freight traffic manager	Omaha.
J. W. McClymonds	General agent ref'r service	Omaha.
R. L. Huntley	Chief engineer	Omaha.
N. D. Ballantine	Superintendent of transportation	Omaha.
F. E. Lewis	Manager dining cars and hotels	Ogden.

The following officers of the Los Angeles & Salt Lake will serve in the positions indicated below:

Name	Former position	New position	Headquarters
C. P. Smith	Secretary	Asst. secretary	Los Angeles
W. H. Leete	Treasurer	Asst. treasurer	Los Angeles
W. H. Comstock	General manager	General manager	Los Angeles
A. S. Halstead	General counsel	General solicitor	Los Angeles
A. S. Edmonds	Gen'l traff. mgr.	Traffic manager	Los Angeles
M. D. Brabant	Asst. gen'l traff. mgr.	Asst. traffic mgr.	Los Angeles
T. M. Sloan	Gen'l frt. agt.	Gen'l frt. agt.	Los Angeles
T. C. Peck	Gen'l pass. agt.	Gen'l pass. agt.	Los Angeles
C. C. Barry	Auditor	Auditor	Los Angeles
A. Maguire	Chief engineer	Asst. chief engineer.	Los Angeles
G. W. Thompson	Supt. dining cars and hotels.	Supt. dining cars and hotels.	Los Angeles

These changes were effective July 14.

Traffic

H. C. Dinkins has been appointed general agent of the Missouri Pacific, with headquarters at Mexico City, Mex.

Mechanical

J. S. Allen has been appointed master mechanic of the Brownville division of the Canadian Pacific, with headquarters at Brownville Junction, Me., succeeding E. Bowie, transferred, effective July 16.

Obituary

John F. Morris, commercial agent of the Michigan Central, died at Buffalo, N. Y., on July 14.

C. M. Agnew, commercial agent of the Southern, with headquarters at Dallas, Tex., died at his home in Oak Cliff, Tex., on July 20.

Edwin N. Armstrong, president of the Toledo, Peoria & Western, died at Peoria, Ill., on July 26. Mr. Armstrong was born at Nashua, N. H., September 19, 1845, and entered railway service as a warehouseman for the Illinois Central in 1867. He then became a telegraph operator for the same company, and in 1869 became a train dispatcher for the Indianapolis, Bloomington & Western (now a part of the Cleveland, Cincinnati, Chicago & St. Louis). In 1872 he went with the Toledo, Peoria & Warsaw (now the Toledo, Peoria & Western) in a similar capacity. In 1880 he became superintendent of the Iowa division of the Wabash and subsequently served in a similar capacity on the Chicago, Middle and Northern divisions of the same road. In 1885 he was appointed general superintendent of the Toledo, Peoria & Western and in 1904 was elected to the presidency and continued in that position until the time of his death.

Marcus A. Low, formerly general attorney of the Chicago, Rock Island & Pacific, died at his home in Topeka, Kan., on July 19. He was born at Guilford, Me., on August 1, 1842, and was educated at the law school of the University of Michigan. After engaging in the private practice of law, Mr. Low entered railroad service in 1886, as president of the St. Joseph & Iowa railroad. From 1887 to 1892, he served as general solicitor of that road and of the Chicago, Kansas & Nebraska. In the latter year he was appointed general attorney of the Rock Island and at the same time was made general solicitor of the Chicago, Rock Island & Texas. In 1902 and 1903 he served as general solicitor of the Chicago, Rock Island & Gulf and the Chicago, Rock Island & Mexico, in addition to his other duties. Mr. Low, who retired from railroad service in 1912, was for a number of years prominent in national republican politics.

THE MISSOURI, KANSAS & TEXAS has reported that of 19,213 merchandise cars run on its lines during the period between January 1 and June 12, 17,793 or 92.6 per cent arrived on time. Only 118 cars, or 0.6 per cent, were 48 hours late.